

C/CAG
City/County Association of Governments
of San Mateo County

VT
Santa Clara Valley Transportation Authority

TA
San Mateo County Transportation Authority

2020 Peninsula Gateway Corridor Study
Policy Advisory Committee

DATE: Wednesday, March 12, 2008
TIME: 4:00 P.M.
PLACE: Menlo Park City Hall
1st Floor Council Conference Room
701 Laurel Street, Menlo Park, CA

- 1. Introductions**
- 2. Notes from January 9, 2008 Meeting***
- 3. Final Project Categorization Results***
- 4. Draft Report - 2020 Peninsula Gateway Corridor Study****
- 5. Work Plan – Next Steps***
- 6. Schedule next meeting for April 9, 2008**
- 7. Adjourn.**

* Attachment

* Hard copies of the Draft Report will also be mailed to PAC members

2020 Peninsula Gateway Corridor Study

Policy Advisory Committee

Meeting Notes – January 9, 2008

Attendees:

| | |
|--|--|
| John Boyle (City of Menlo Park) | Rich Gordon (San Mateo Co. Transportation Authority) |
| Alicia Aguirre (City of Redwood City) | Sue Lempert (MTC) |
| Bijan Sartipi (Caltrans) | Scott Haywood (VTA) |
| Yoriko Kishimoto (City of Palo Alto) | Mike Vroman (City of Mountain View) |
| Rose Jacobs Gibson (San Mateo Co; C/CAG) | Dwayne Bay (Public – City of East Palo Alto) |
| Joe Hurley (SMCTA) | Richard Napier (C/CAG) |
| Sandy Wong (C/CAG) | Paul Krupka (KHA) |
| John Hoang (C/CAG) | |

- Categorization was completed for projects WW through EEE. The following spreadsheet summarizes all the results including results from the TAC meetings.
- Discussion items related to completing the Study are as follows:
 - Expand definition of categories
 - Identify process for prioritization and implementation project alternatives
 - Defining the role of the PAC
 - Establish the final goal and action plan for the Study
 - Plan and preparation for Council presentations

**2020 Gateway Study
Categorization Results
FINAL**

| ID | Potential Improvements | TAC Final 2/6/08 | PAC 12/12/07 & 1/9/08 | TAC 11/7/07 | Sponsors 10/26/07 | Notes |
|--|--|---------------------|--------------------------|-------------|----------------------|---|
| HIGHWAY 101 | | | | | | |
| A | Auxiliary Lanes from Embarcadero to Shoreline ·Include flood control enhancements at creek crossings | 1 | 1 | 1 | 1 | Refer to VTA |
| B | Reconstruct Embarcadero/ Oregon interchange | 3 | 1 | 4 | 3 | |
| C | Reconstruct San Antonio interchange and eliminate southbound on ramp at Charleston | 3 | 1 | 3 | 3 | Mt. View doesn't want to eliminate ramp |
| D1 | Widen freeway to 10 lanes (County Line to Shoreline) | 1 | 1 | 1 | 4 | Refer to VTA |
| D2 | Widen freeway to 10 lanes + Aux Lanes (County Line to Shoreline) | 5 | 5 | 5 | 5 | |
| E | Widen freeway to 10 lanes + Aux Lanes (Whipple to County Line) | 5 | 5 | 5 | 5 | |
| F | Build elevated lanes above 101 from Woodside Road to 85/101 North project conform ·Consider mixed-flow lanes or HOV/HOT lanes ·NOTE: similar project profiled in Civil Engineering in June 2004 | 5 (4) | 5 | 4 | 4 | Changed to 5 |
| G | Improve local access across 101 | 1 (3)- | 1 | 3 | 3 | Changed to 1; remove local traffic from I/C |
| DUMBARTON BRIDGE TO HIGHWAY 101 | | | | | | |
| H | Grade separations at Bayfront/Willow and Bayfront/University | 3 | 1 | 3 | 3 & 5 | Consider both together and separate |
| I | Extend Bayfront Expressway to Woodside Road | 1 | 1 or 3 | 1 | 1 | Refer to RWC, MP, or County |
| J | Construct direct flyover connection between Bayfront/ Marsh and 101 north of Marsh | 3 | 1 or 3 | 3 | 4 | |
| K | Elevated Direct Connections between Bayfront and 101 along Willow Road corridor ·SEE Improvement CC | n/a | n/a | skip | skip | |
| L | Elevated roadway along Dumbarton RR corridor between University and 101 | 5 | 5 | 5 | 5 | |
| M | New 101 South connection through East Palo Alto (Expressway south of University) | 5 | 5 | 5 | 5 | |
| N | New 101 South connection skirting East Palo Alto (Expressway/viaduct along edge of bay) · Direct connections at Bayfront Expressway (east of University) and Highway 101 (near Embarcadero/Oregon interchange) ·Bridges over Hetch-Hetchy pipelines and Dumbarton RR ·Skirt Ravenswood Open Space Preserve, Baylands, and Palo Alto Golf Course ·2- 4 lane viaduct, with piers designed to limit environmental impacts ·Consider HOV-only or HOT-only usage | 5 | 5 | 5 | 5 | |
| O | Tunnel beneath East Palo Alto ·University Avenue to Highway 101(near Embarcadero/Oregon interchange) · Beneath Ravenswood Industrial Area & residential neighborhoods south of University | 5 (4) | 4 | 4 | 5 | Changed to 5 |
| P | San Francisquito Creek Diversion Structure and Roadway (dual use tunnel facility) | 5 | 1 | 4 | 5 | Removed "roadway" |
| P1 | Route 101 flood control project potentially down Willow Road. | 5 | 1 | 5 | 5 | |
| WILLOW ROAD | | | | | | |
| Q | Signal Timing during peak travel periods: ·Consider adaptive or responsive operation ·Install vehicle detection | 2 | 2 | 2A | 2 | |
| R | Prohibit left turns during peak travel periods | 2 | 5 | 4 | 2 | |
| S | Prohibit local cross traffic during peak travel periods | 5 | 5 | 5 | 5 | |
| T | Exit/Entrance Right Turn pockets on Willow | 2 | 3 | 2A | 2 | |
| U | Set back curb line one lane width from traveled way at driveways | 5 | 4 | 5 | 5 | |
| V | Eliminate driveway access on Willow | 5 | 5 | 5 | 5 | |
| W | Eliminate selected signalized intersections: Newbridge St, Ivy Dr, Hamilton Ave | 5 | 5 | 5 | 5 | |
| X | Eliminate signalized intersections and allow right turns only on/off Willow | 5 | 5 | 5 | 5 | |
| Y | Eliminate signalized intersections and prohibit any access from local streets | 5 | 5 | 5 | 5 | |
| Z | Widen Willow one lane each direction | 5 | 5 | 5 | 5 | |
| AA | Grade separations at selected intersections: Newbridge St, Ivy Dr, Hamilton Ave | 5 | 4 | 5 | 5 | |
| BB | Pedestrian over crossing at Ivy Dr (near Mid-Peninsula High School) | 1 | 1 | 3 | 4 | Refer to Menlo Park |
| CC1 | Elevated viaduct expressway structure: 2 lanes in each direction | 5 | 5 | 5 | 5 | |
| CC2 | Elevated viaduct expressway structure: 1 lane in each direction | 5 | 5 | 5 | 5 | |
| CC3 | Elevated viaduct expressway structure: Reversible 2 lanes | 5 | 5 | 5 | 5 | |
| CC4 | Elevated viaduct expressway structure: 3 lanes with reversible middle lane | 5 | 5 | 5 | 5 | |
| DD1 | Depressed expressway: 2 lanes each direction | 3 | 5 | 3 | 2 | University Av. - TTs |

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|--|--|---------------------|--------------------------|-------------|----------------------|------------------------------|
| DD2 | Depressed expressway: 1 lane each direction | 3 | 1 or 3 | 3 | 2 | |
| DD3 | Depressed expressway: Reversible 2 lanes | 3 | 1 or 3 | 3 | 2 | |
| DD4 | Depressed expressway: 3 lanes with reversible middle lane | 3 | 1 or 3 | 3 | 2 | |
| EE | Grade separations at all intersections (over crossings or under crossings) | 5 | 5 | 5 | 5 | |
| FF | Tunnel Expressway (maintain existing facility at grade) | 3 | 4 | 3 | 2 | |
| GG | Modified depressed Expressway (surface frontage roads cantilevered inboard to minimize frontage impacts) | 3 | 1 or 3 | 3 | 2 | |
| UNIVERSITY AVENUE | | | | | | |
| HH | Signal Timing during peak travel periods -Consider adaptive or responsive operation -Install vehicle detection | 2 | 1 | 2A | 2 | |
| II | Prohibit left turns during peak travel periods | 2 | 5 (2A) | 4 | 2 | |
| JJ | Prohibit local cross traffic during peak travel periods | 5 | 5 | 5 | 5 | |
| KK | Entrance/Exit Right Turn pockets on University | 2 | 3 | 2A | 2 | |
| LL | Set back curb line one lane width from traveled way at driveways | 5 | 5 | 5 | 5 | |
| MM | Eliminate driveway access on University | 5 | 5 | 5 | 5 | |
| NN | Eliminate selected signalized intersections: Bell, Runnymede, Kavanaugh | 5 | 5 | 5 | 5 | |
| OO | Eliminate signalized intersections and allow right turns only on/off University | 5 | 5 | 5 | 5 | |
| PP | Eliminate signalized intersections and prohibit any access from local streets | 5 | 5 | 5 | 5 | |
| QQ | Widen University one lane each direction | 5 | 5 | 5 | 5 | |
| RR | Grade separations at selected intersections: Donohoe, Bay | 5 | 4 | 5 | 5 | |
| SS1 | Elevated expressway/viaduct along University corridor: 2 lanes each direction | 5 | 5 | 5 | 5 | |
| SS2 | Elevated viaduct expressway structure: 1 lane in each direction | 5 | 5 | 5 | 5 | |
| SS3 | Elevated viaduct expressway structure: Reversible 2 lanes | 5 | 5 | 5 | 5 | |
| SS4 | Elevated viaduct expressway structure: 3 lanes with reversible middle lane | 5 | 5 | 5 | 5 | |
| TT1 | Depressed expressway: 2 lanes each direction | 3 | 5 | 3 | 4 | Willow Rd. - DDs |
| TT2 | Depressed expressway: 1 lane each direction | 3 | 4 | 3 | 4 | |
| TT3 | Depressed expressway: Reversible 2 lanes | 3 | 4 | 3 | 4 | |
| TT4 | Depressed expressway: 3 lanes with reversible middle lane | 3 | 5 | 3 | 4 | |
| UU | Grade separations at all intersections (over crossings or under crossings) | 5 | 4 | 5 | 5 | |
| VV | Tunnel Expressway, (maintain existing facility at grade) | 3 | 4 | 3 | 4 | |
| WW | Modified depressed Expressway (surface frontage roads cantilevered inboard to minimize frontage impacts) | 3 | 4 | 3 | 4 | |
| COMPLEMENTARY ITS ELEMENTS (to be included in project definitions as appropriate) | | | | | | |
| XX | Install traffic signal interconnect/communications infrastructure between Middlefield Road and 101 | 2 | 1 or 2 | 2A | 2 | |
| YY | Install transit signal priority to support high-patronage bus routes. | 1 | 1 or 2 | 1 | 1 | Refer to Samtrans and/or VTA |
| ZZ | Install trailblazers and/or arterial CMS to provide route guidance information | 2 | 2 | 2A | 2 | |
| AAA | Prepare Incident Management and Traveler Information Plan for Corridor | 2 | 2 | 2A | 2 | |
| OTHER POTENTIAL IMPROVEMENTS NOTED BY PUBLIC AND OTHERS | | | | | | |
| BBB | Study the possible designation of East Bayshore (San Antonio to University) as a reliever route to provide congestion relief and for incident management on Route 101 -Improve operations at intersections -Install directional signage to help keep commuters off residential streets | 2 | 2 | 2B | 2 | |
| CCC | Improve 101/ University interchange -Construct southbound direct-connect off-ramp -Improve on-off connections for northbound traffic | 2 | 2A/2B | 2A | 3 | |
| DDD | Define residential traffic management elements that complement high priority capital improvements | 2 | 2 | 2A/2B | 2 | |
| EEE | Extend Central Expressway to Sandhill Road | 5 | 5 | 5 | 5 | |

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Categorization Results
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|------------|--|---------------------|--------------------------|-------------|----------------------|-------|
| KEY | | | | | | |
| 1 | Referral To Other Agency | | | | | |
| 2 | Project Development (A - Short-term, 5 yrs or B - Long-term 10-15 yrs) | | | | | |
| 3 | Phase II Study | | | | | |
| 4 | Study Later | | | | | |
| 5 | Not Consistent With Goals | | | | | |

Prepared by:



Kimley-Horn
and Associates, Inc.

DRAFT STUDY REPORT

2020 PENINSULA GATEWAY CORRIDOR STUDY

February 21, 2008

Prepared for



2020 Peninsula Gateway Corridor Study

Draft Study Report

Prepared for:



Prepared by:



**Kimley-Horn
and Associates, Inc.**

February 21, 2008

This draft report presents the procedures and findings of the **2020 Peninsula Gateway Corridor Study**, which was conducted by Kimley-Horn and Associates, Inc. (KHA) under contract to the City/County Association of Governments of San Mateo County (C/CAG) in partnership with the San Mateo County Transportation Authority (SMCTA) and Santa Clara Valley Transportation Authority (VTA). This document is organized as follows:

- I. The Problem and Potential Solutions
- II. Detailed Evaluation of Certain Solutions
- III. Findings and Next Steps

I. The Problem and Potential Solutions

A. Study Objectives

The objective of this study was to define and evaluate alternative traffic improvements in the study area that address the *Study Goals*, which are listed below:

- Facilitate access;
- Enhance economic opportunities;
- Optimize use of existing infrastructure;
- Reduce congestion and local community impacts; and
- Minimize environmental impacts on sensitive resources.

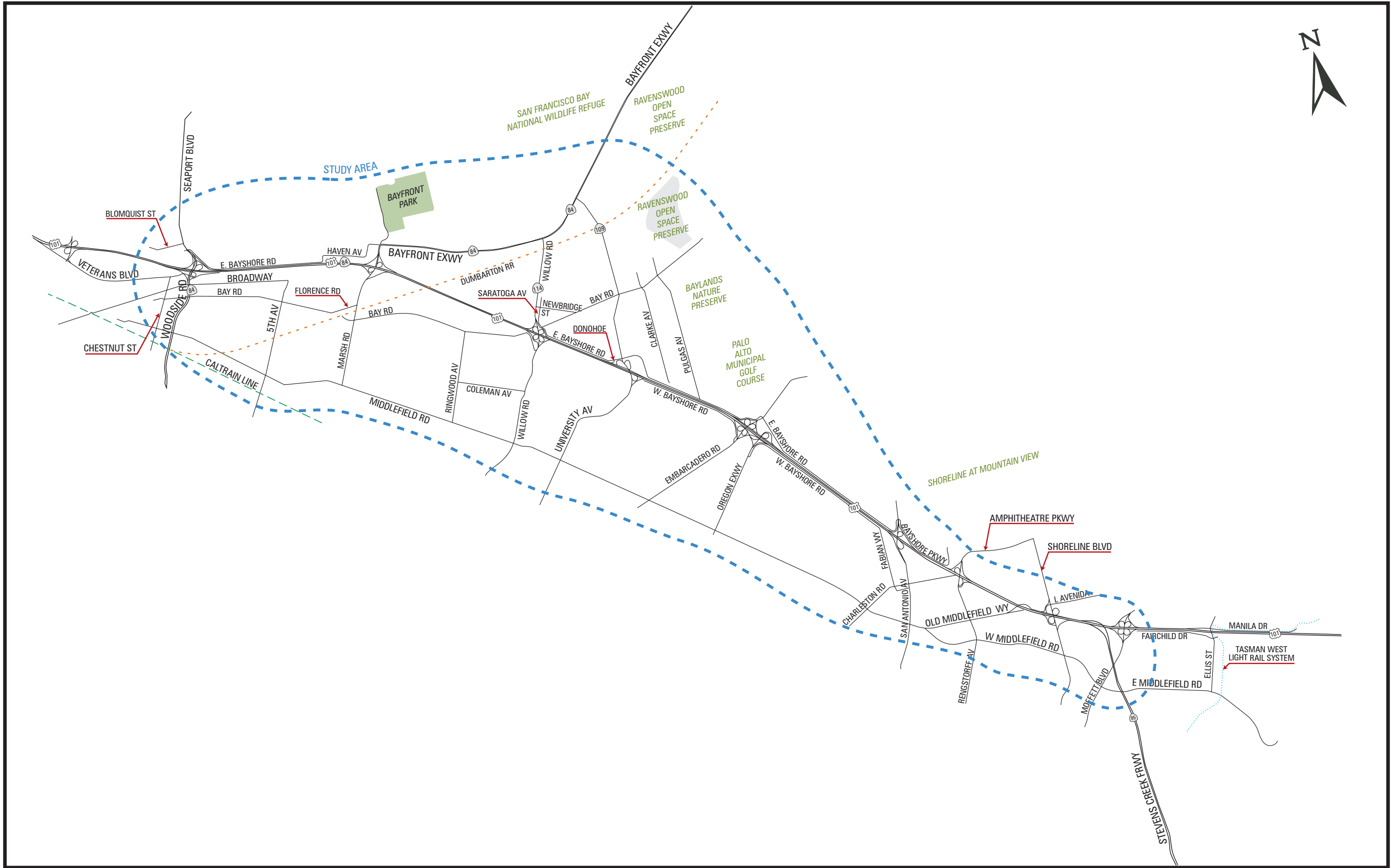
The study area, as defined in **Figures 1 and 2**, encompasses Highway 101 from just north of SR 84 (Woodside Road) to just south of the Route 85 (Stevens Creek Freeway) junction, as well as SR 84 (Bayfront Expressway) from the Dumbarton Bridge landing to Highway 101 including the connecting streets between the Bayfront Expressway and Highway 101.

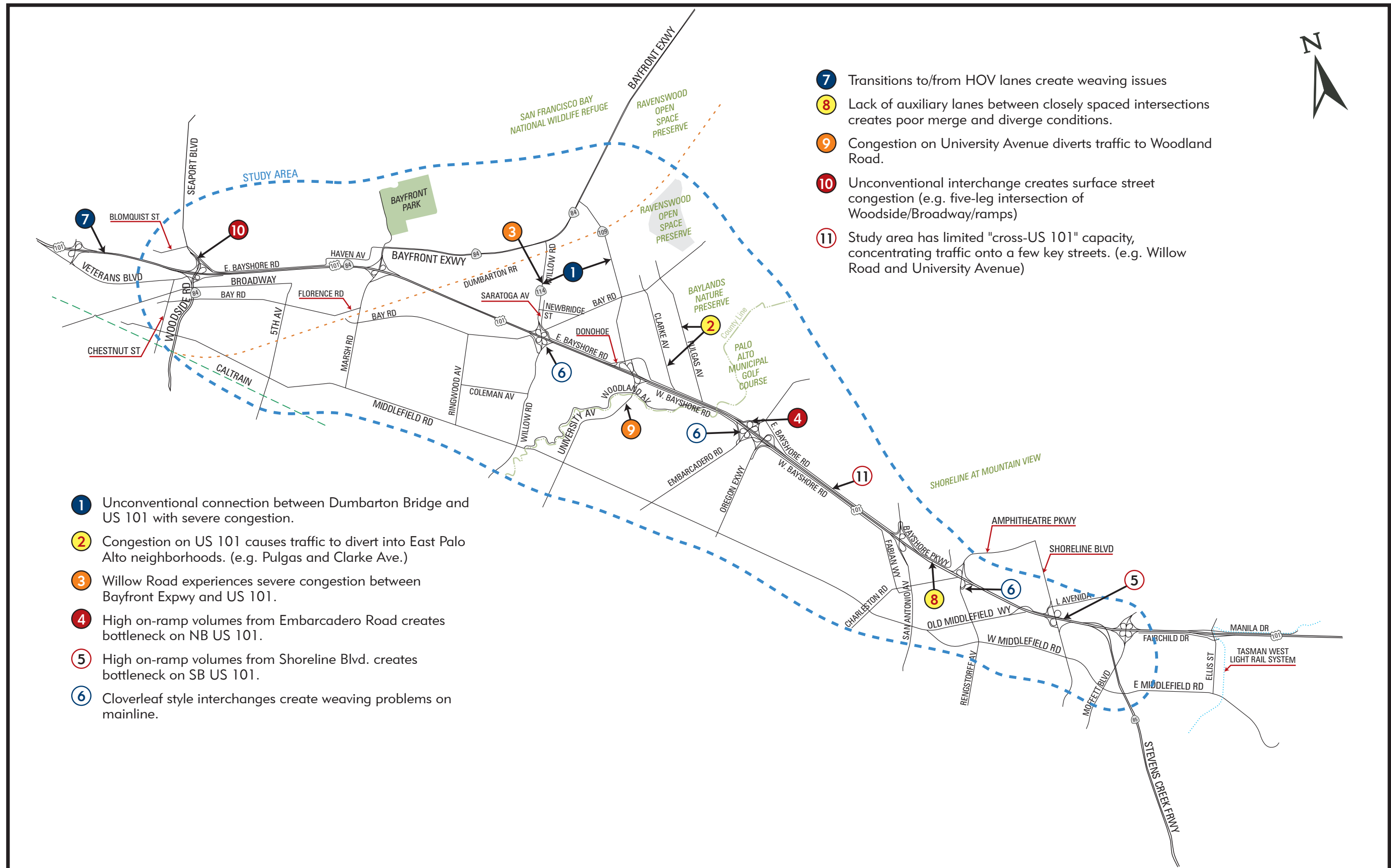
B. Definition of Problem

The State highways within the study area all experience substantial traffic demand and poor operating conditions during the peak commute periods. Several important findings from the review of existing conditions are summarized below and illustrated in **Figure 3**.

- The unconventional connection between the Dumbarton Bridge (SR 84) and Highway 101 creates congestion on arterial highways SR 109 (University Avenue) and SR 114 (Willow Road) and the interchanges with Highway 101.
- Congestion of arterial highways approaching and departing the Dumbarton Bridge creates neighborhood traffic impacts in Menlo Park, Palo Alto and East Palo Alto.
- Older full cloverleaf interchanges without collector-distributor roads create short weave conditions resulting in pockets of congestion, which have upstream effects on traffic flow.







- Where High Occupancy Vehicle (HOV) lanes end or near major interchanges, there is substantial weaving on mainline Highway 101 resulting in bottlenecks and upstream congestion.
- Select high volume freeway ramps with short merge areas create bottlenecks that cause upstream congestion.
- Lack of auxiliary lanes between closely spaced interchange ramps creates numerous weaving conditions throughout the corridor, exacerbating highly congested conditions.
- Accident rates on certain segments of State highways in the study area are significantly higher than the statewide average for similar facilities.
- Poorly configured off-ramp intersections with surface streets, combined with high traffic volumes, create back-ups that extend onto Highway 101.
- Methods to monitor and control flows are not present.

C. Future “No-Build” Conditions

Future no-build conditions with no improvements were analyzed. The anticipated congestion levels for 2025 as well as the percentage change in congestion from present day to 2025 are depicted in **Figure 4**. By observation, today’s big problem will be tomorrow’s bigger problem under a “No-Build” scenario.

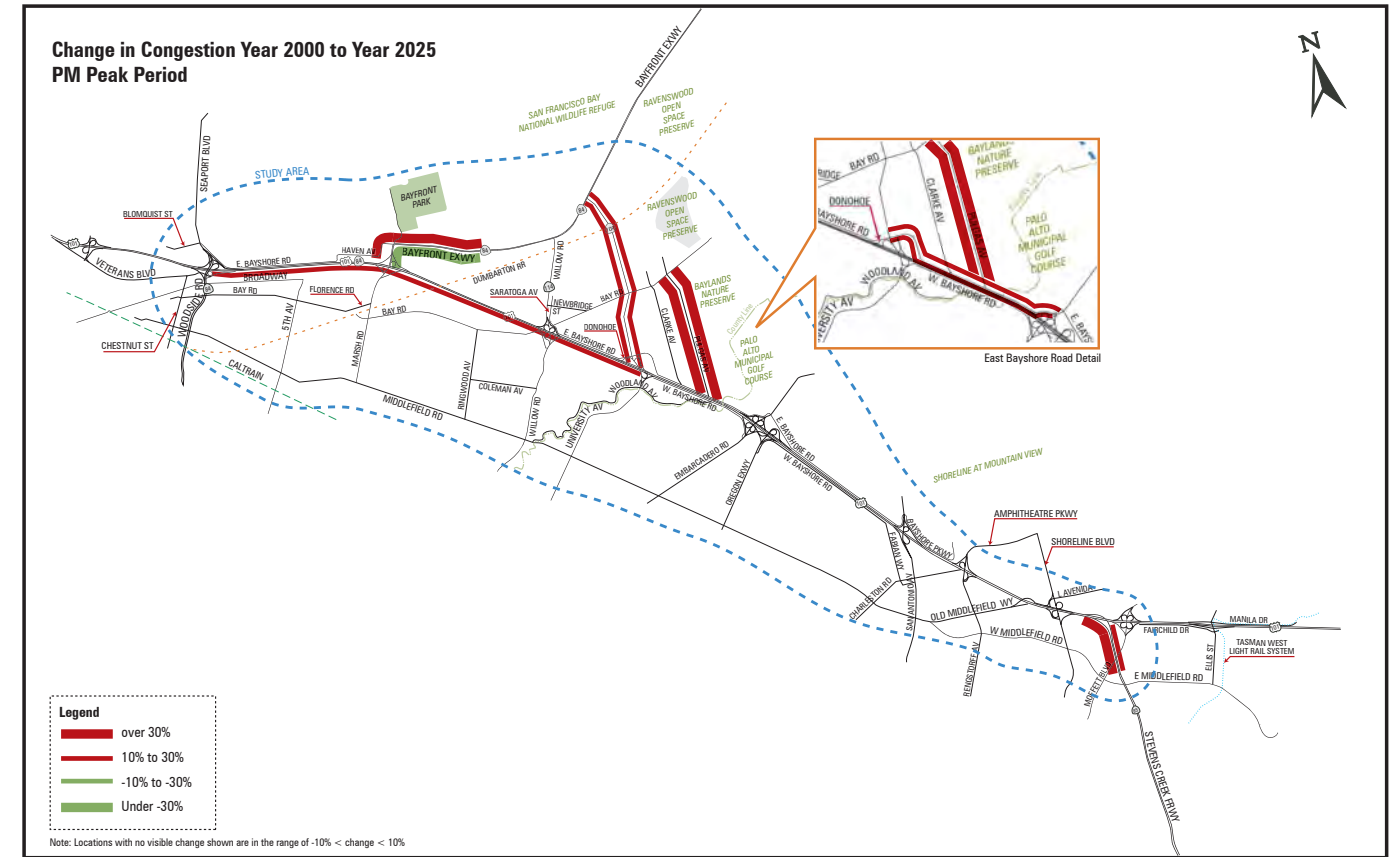
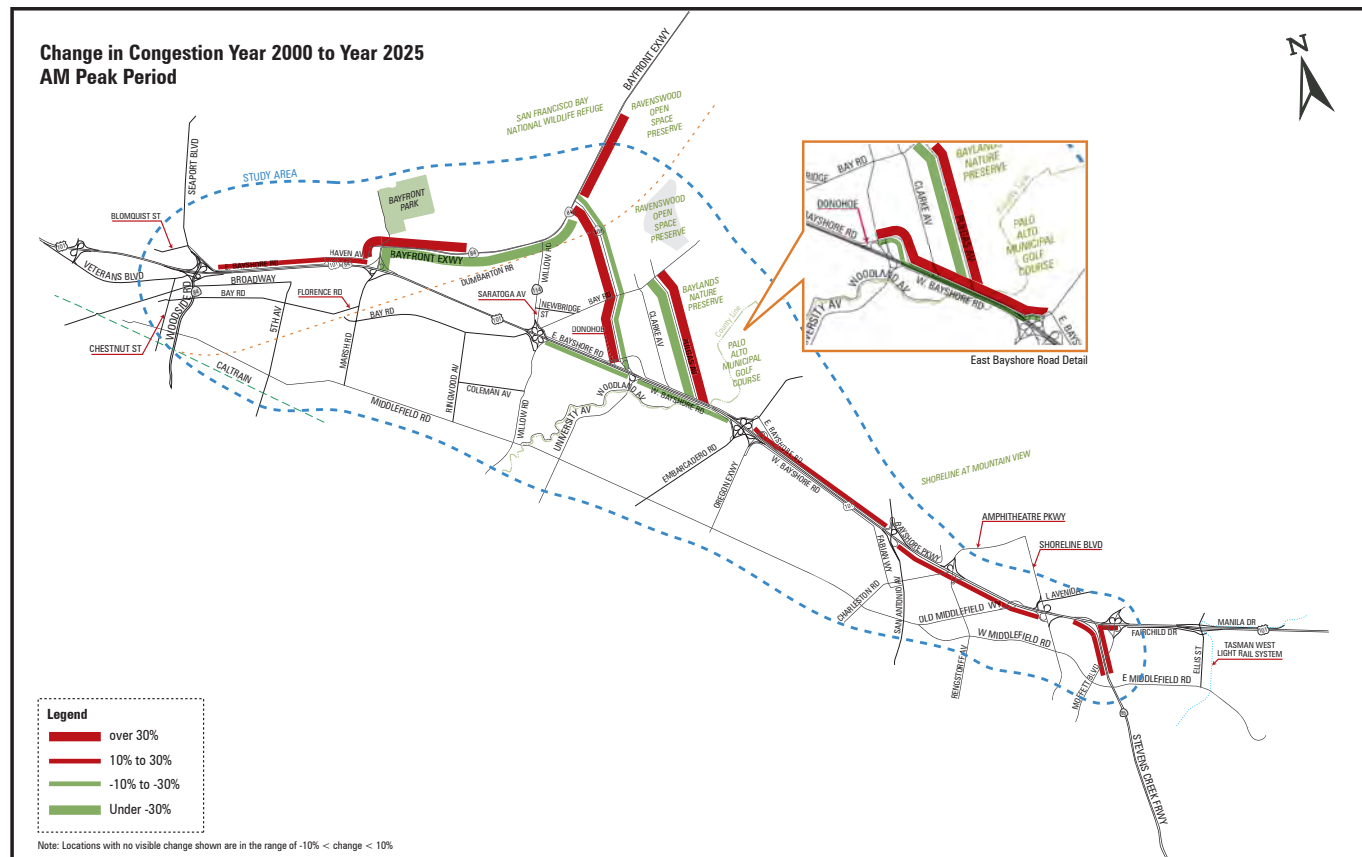
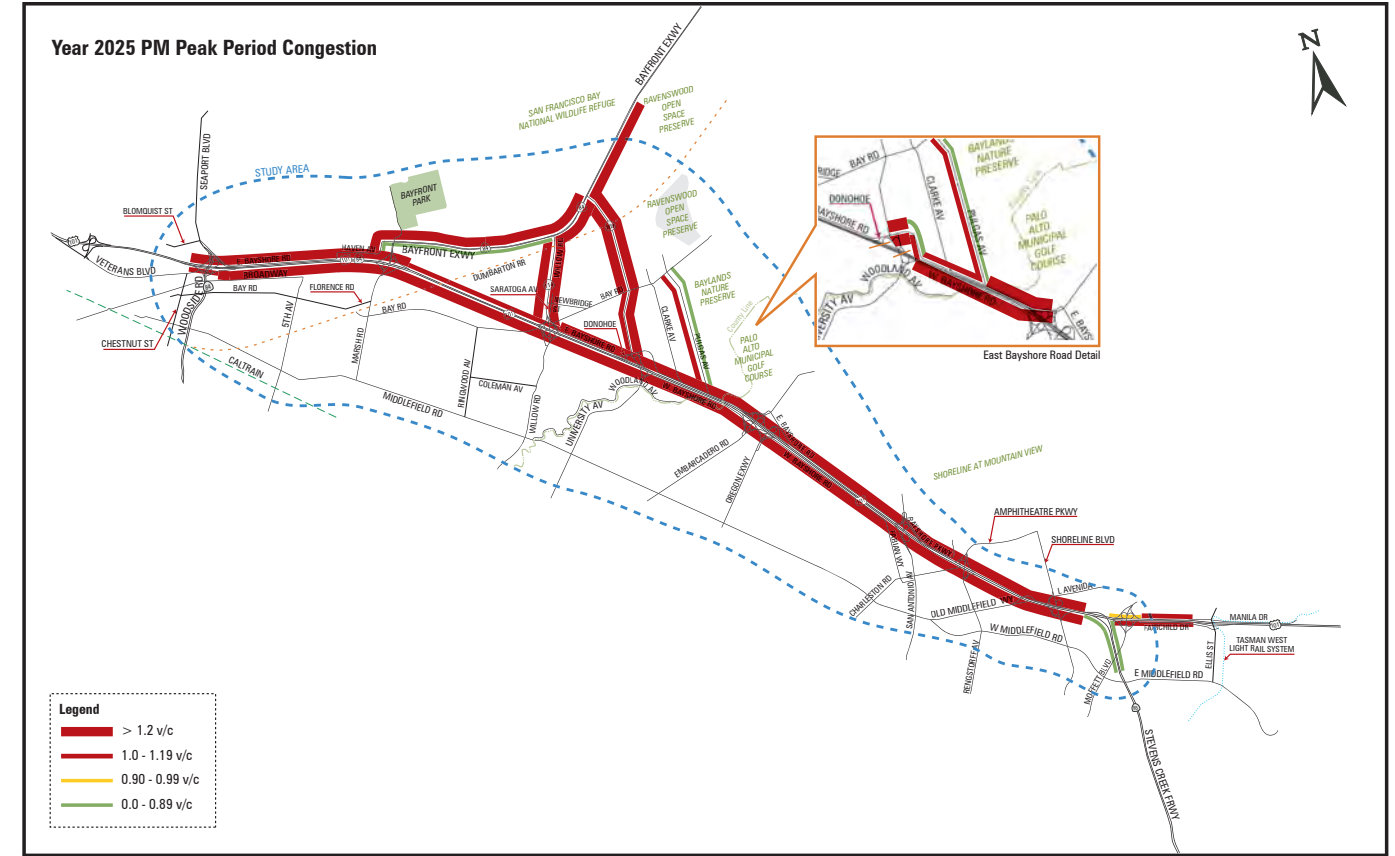
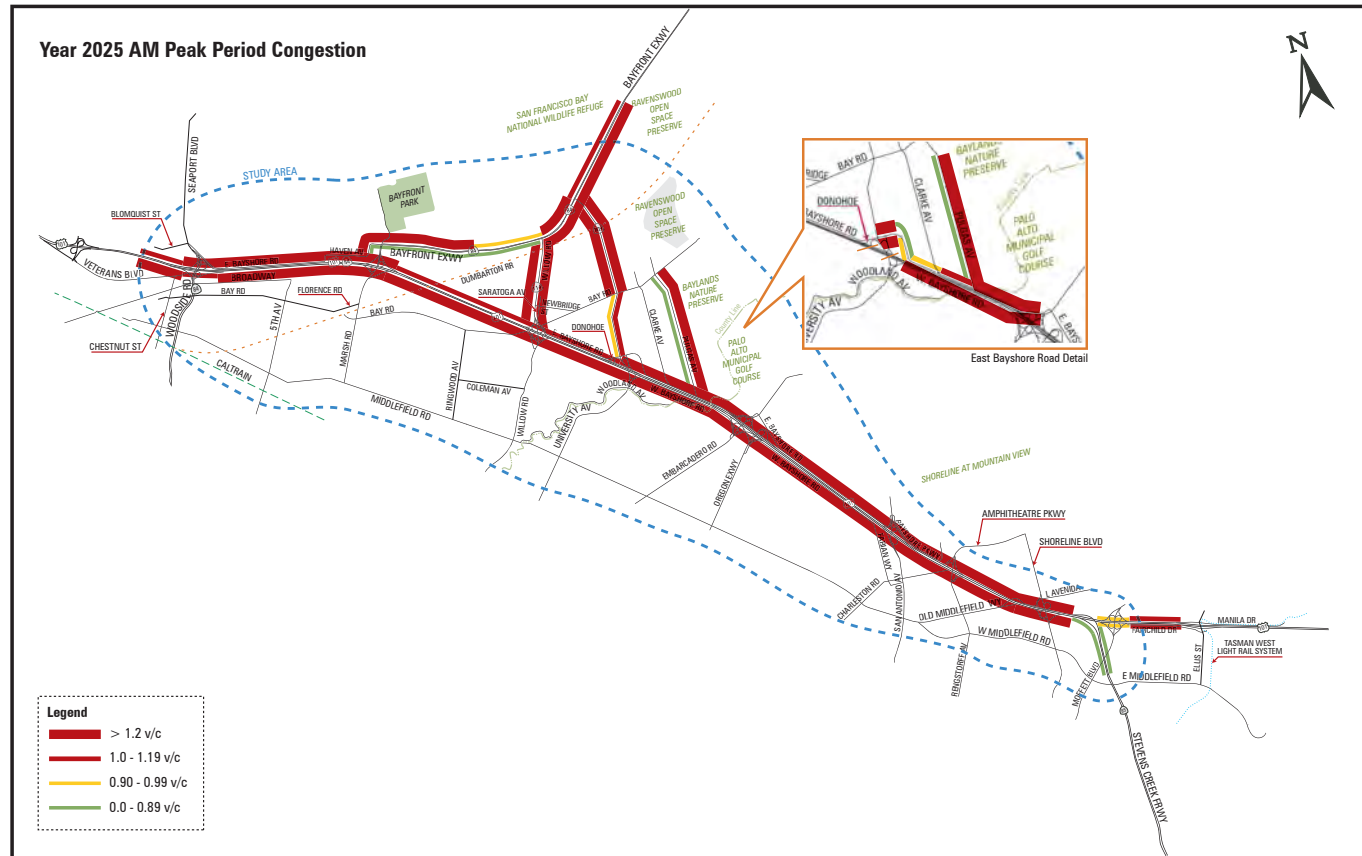
D. Development of Universe of Potential Solutions

The alternatives summarized in this draft report evolved from a series of interim products describing the possible “universe” of alternatives that could potentially address the traffic issues in the corridor in the context of the Study Goals. The first step was to develop a series of themes and their corresponding issues within the corridor. Potential solutions were then brainstormed relating to each theme. Improvements that would complement the solutions, if applicable, were also defined. This process is summarized below.

THEME: Improve connection (i.e. increase traffic capacity) between Dumbarton Bridge touchdown and Highway 101 North

ISSUES:

- Congestion at intersections on Bayfront Expressway with University Ave., Willow Road, and Marsh Road
- Conflicting traffic movements at Marsh Road/Highway 101 interchange
- Willow Road, although a State Highway, is only a four-lane arterial primarily serving local uses and lacks capacity
- University Avenue is a four-lane arterial serving many local uses and lacks capacity



POTENTIAL SOLUTIONS:

- Direct flyover connections between Bayfront/Marsh and Highway 101 (north of Marsh)
- Bayfront Expressway extension to Woodside Road Interchange
- Elevated roadway over Dumbarton RR between University and Highway 101 (south of Marsh)
- Grade separate University/Bayfront Expressway intersection
- Grade separate Willow/Bayfront intersection
- Aerial braided roadway connections leaving southbound Highway 101 downstream of Dumbarton Railroad Bridge, proceeding to Willow Road and merging with the northbound connection.

COMPLEMENTARY IMPROVEMENTS:

- ITS, congestion pricing
- Combine improvements addressing connection to Highway 101 South

THEME: Improve connection (i.e. increase traffic capacity) between Dumbarton Bridge touchdown and Highway 101 South**ISSUES:**

- Congestion at intersections on Bayfront Expressway with University Ave. and Willow Road
- Willow Road, although a State Highway, is only a four-lane arterial primarily serving local uses and lacks capacity
- University Avenue is a four-lane arterial serving many local uses and lacks capacity

POTENTIAL SOLUTIONS:

- New south connection (various alignment options)
- Tunnel beneath East Palo Alto between (roughly) the Dumbarton Bridge and Highway 101, beneath the Ravenswood Industrial Area and the residential neighborhoods on East Palo Alto's residential subdivisions.
- Aerial braided roadway connections leaving northbound on Highway 101 upstream of Oregon/Embarcadero, aligned over E. Bayshore Road and crossing University Avenue, proceeding to Willow Road and continuing over Willow Road to Bayfront Expressway, continuing over Bayfront Expressway to touchdown just west of the Dumbarton Bridge;

COMPLEMENTARY IMPROVEMENTS:

- ITS, congestion pricing
- Combine improvements addressing connection to Highway 101 North

THEME: Expand capacity on Highway 101 South (County line to Shoreline Blvd.)

ISSUES:

- Heavy congestion in both directions of Highway 101 (LOS F)
- Relatively high accident rates on Highway 101
- No existing or planned auxiliary lanes to match SM County Highway 101 cross-section
- No southbound on-ramp at San Antonio Rd. forces traffic to Charleston Road on-ramp (which merges to Highway 101 slightly upstream of Rengstorff Avenue off-ramp and therefore is limited in capacity)

POTENTIAL SOLUTIONS:

- Auxiliary lanes on Highway 101 from Embarcadero Rd. to Shoreline Blvd.
- Widen Highway 101 to ten through lanes (4 mixed flow, 1 HOV each direction) and reconstruct interchanges at Embarcadero Rd/Oregon Expwy, San Antonio Rd., and Rengstorff Ave., and perhaps Old Middlefield Way
- Widen Highway 101 to 12 lanes (4 mixed flow, 1 auxiliary, 1 HOV each direction)
- Reconstruct Embarcadero/Oregon interchanges to provide room for ultimate 10-12 lanes

COMPLEMENTARY IMPROVEMENTS:

- Convert HOV lanes to mixed flow lanes
- ITS

DISCUSSION:

- Complements SR 85/Highway 101 North project and SMCTA Auxiliary Lanes Project (Marsh Rd. to County line)
- SR 85/Highway 101 North project will construct 12 lane cross section at Shoreline Rd. that narrows to 11 lanes at Old Middlefield Way and then to 8 lanes north of Old Middlefield Way

THEME: Expand capacity on Highway 101 North (County Line to Woodside Road)**ISSUES:**

- Extreme congestion during long a.m. and p.m. peak periods, in both directions

POTENTIAL SOLUTIONS:

- Widen Highway 101 to 12 lanes (4 mixed flow, 1 auxiliary, 1 HOV each direction), which would require reconstruction of interchanges at Woodside Road, Marsh Road, Willow Road, and University Avenue
- Put HOV lanes on structure, use remaining available space for one added through lane each direction; HOV lanes may need to be express to bypass local interchanges
- Build elevated deck to accommodate 2 (or more) added mixed flow lanes above Highway 101, which could be reversible;
- Reversible lanes on Highway 101
- Reconstruct selected interchanges in phases, to provide clear width for future widening

COMPLEMENTARY IMPROVEMENTS:

- ITS, congestion pricing

DISCUSSION:

- Limited capacity at study boundaries of Highway 101 corridor. Are we simply moving the bottleneck?

THEME: Divert commuter traffic from East Palo Alto neighborhoods (east/south of University)**ISSUES:**

- Heavy commuter traffic (cut-through) volumes and congestion on East Bayshore, Pulgas, Clarke, and Bay in East Palo Alto

POTENTIAL SOLUTIONS:

- New south connection (various alignment options)
- Increase University Avenue capacity (remove parking, widen or two-level roadway, or tunnel and surface roadway, grade separated intersections, or reversible lanes)
- Increase Willow Road capacity (grade separated intersections, “fast lane,” tunnel, reversible lanes, expressway)
- Traffic calming (prohibit movements, prohibit non-resident traffic, etc.) on affected streets;

COMPLEMENTARY IMPROVEMENTS:

- Close neighborhood streets to through traffic in combination with above capacity increases
- Pricing/tolls on new connection
- ITS

THEME: Divert commuter traffic from University Avenue**ISSUES:**

- Heavy congestion on University Avenue due to through traffic
- Street is essentially a barrier that divides the community resulting in safety and quality of life challenges

POTENTIAL SOLUTIONS:

- New south connection (various alignment options)
- Increase Willow Road capacity
- Streetscape and traffic calming improvements on University Avenue
- Roundabouts at Donohoe, Bay, other intersections

COMPLEMENTARY IMPROVEMENTS:

- Close neighborhood streets (Pulgas, Clarke, Bay) to through traffic
- Pricing/tolls on new connection
- ITS

THEME: Traffic calming on local residential streets**ISSUES:**

- Congestion on University Avenue west of Highway 101 induces diversion to Woodland Avenue in Menlo Park
- Heavy commuter cut-through traffic in East Palo Alto (E. Bayshore to Pulgas or Clarke to Bay to University)

POTENTIAL SOLUTIONS:

- Modify Woodland Avenue to maintain access to University Palms/Four Seasons Hotel and impede commuter cut-through traffic
- Close Pulgas, Clarke, and Bay to cut-through traffic using traffic calming improvements

COMPLEMENTARY IMPROVEMENTS:

- ITS

THEME: Improve freeway access**ISSUES:**

- No southbound Highway 101 on-ramp at San Antonio Avenue puts pressure on low-capacity on-ramp at Charleston Road
- Southbound connections at Woodside Road create congestion, limit access to Highway 101

POTENTIAL SOLUTIONS:

- Add southbound on-ramp at San Antonio Avenue and remove on-ramp at Charleston Road
- Reconstruct Highway 101/Woodside Road interchange

THEME: Accommodate traffic impacts of major developments**ISSUES:**

- Abbott Labs and Marina Shores projects in Redwood City will add peak hour vehicle trips to the Seaport Boulevard/Woodside Road/Highway 101 interchange

POTENTIAL SOLUTIONS:

- Widen the planned Blomquist Street Extension from 2 to 4 lanes, creating a 4-lane parallel arterial between Seaport Boulevard and Whipple Road
- Reconstruct Woodside Road interchange
- Widen Woodside Road

THEME: Improve traffic management**ISSUES:**

- Traffic is relatively “self-managed” in the corridor; as a result, poor driving habits and reactionary driving create unnecessary friction, congestion, and incidents
- Without management, traffic flows to fill available capacity regardless of size or nature of street system

POTENTIAL SOLUTIONS:

- Ramp metering to provide more constant/consistent flow on mainline Highway 101
- Metering both directions of Dumbarton Bridge at west touchdown to introduce more orderly flow on University Avenue, Willow Road, Bayfront Expressway, and vehicle input/output at Highway 101

COMPLEMENTARY IMPROVEMENTS:

- ITS
- Pricing/tolls

THEME: Improve local access across Highway 101**ISSUES:**

- Highway 101 interchanges, especially those at Marsh, Willow, and University, act as bottlenecks and therefore barriers to local traffic desiring to cross Highway 101

POTENTIAL SOLUTIONS:

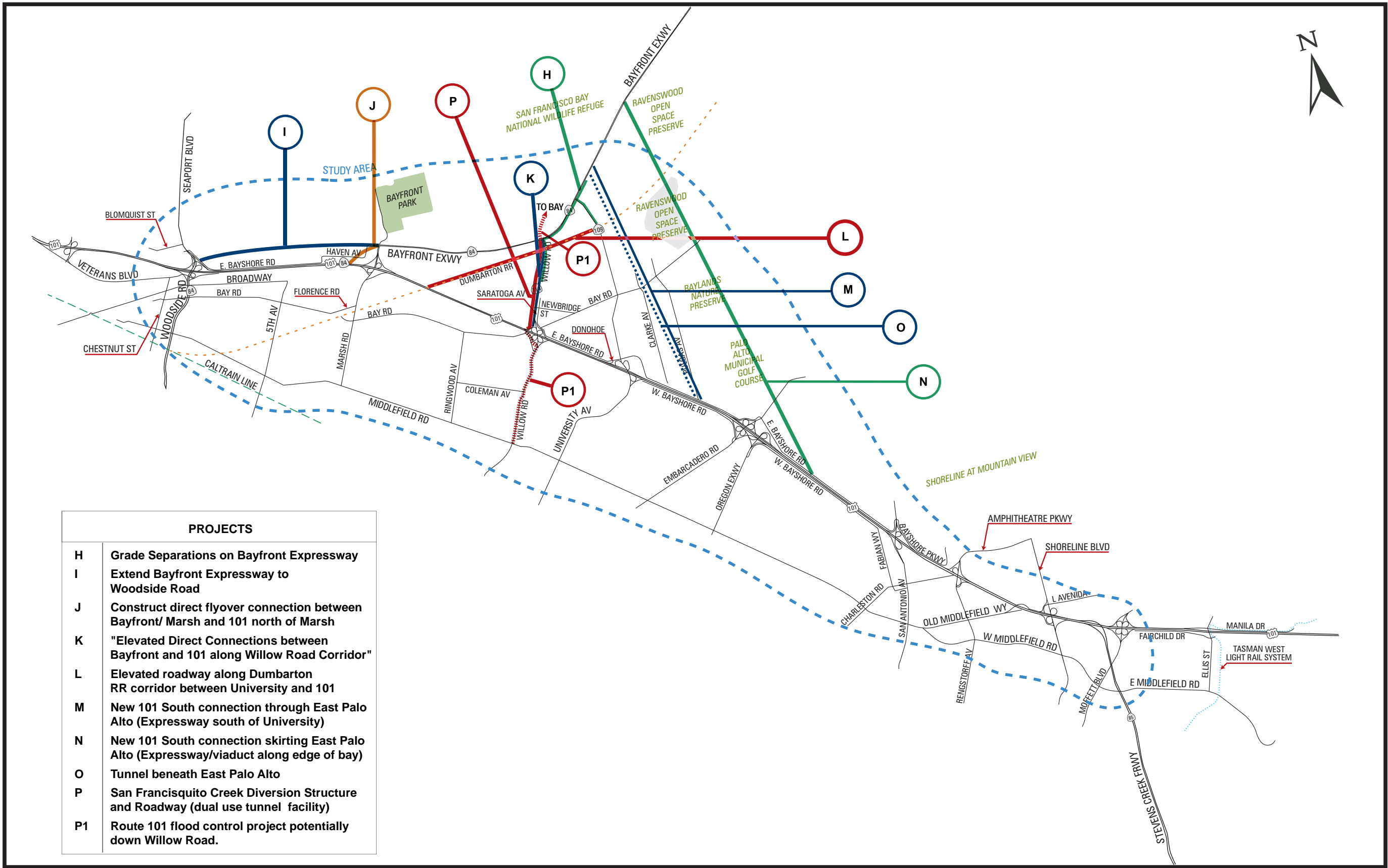
- Restricted-access, limited capacity tunnel or aerial connections across Highway 101 corridor that would serve only crossing traffic, not traffic entering/leaving Highway 101

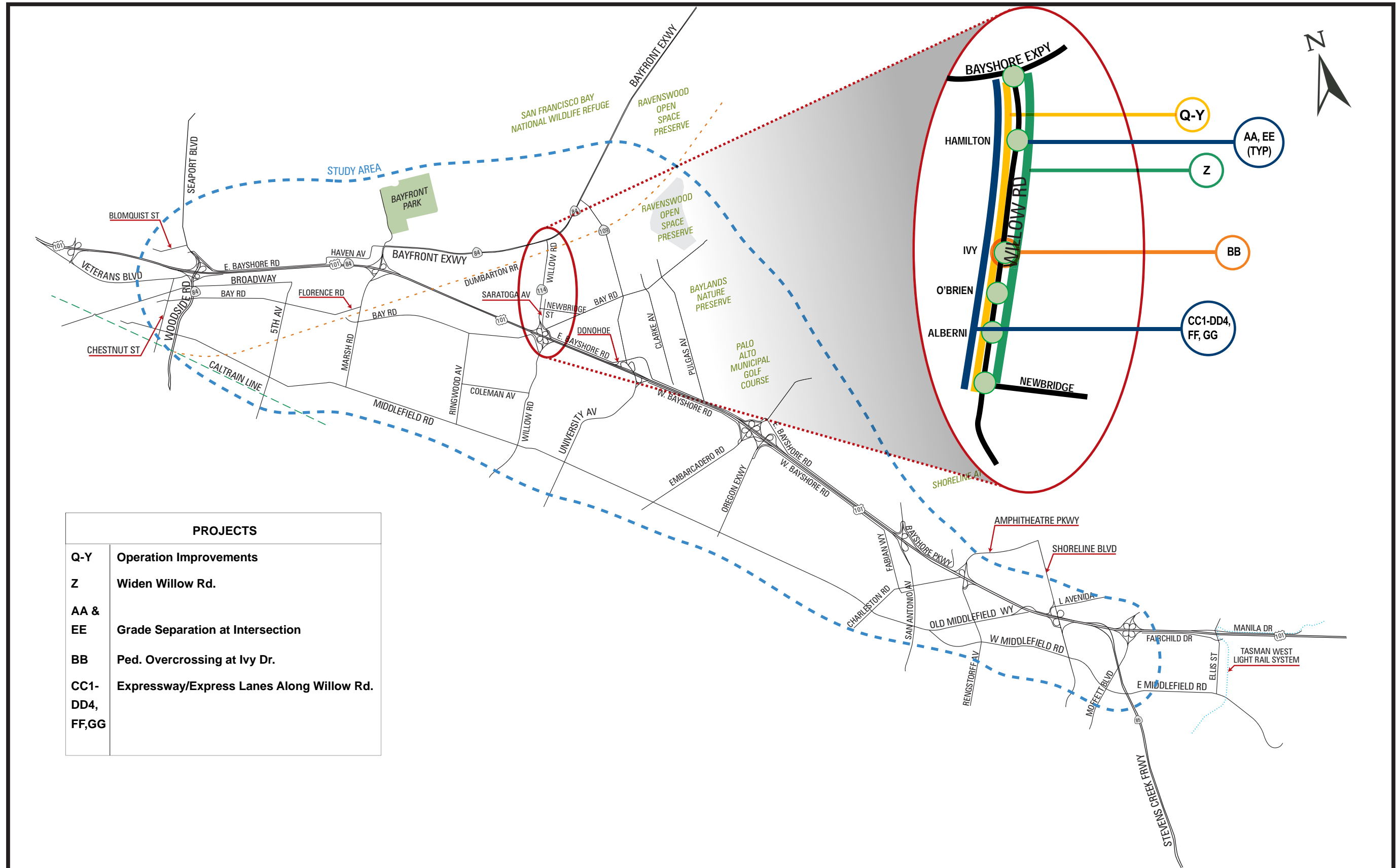
COMPLEMENTARY IMPROVEMENTS:

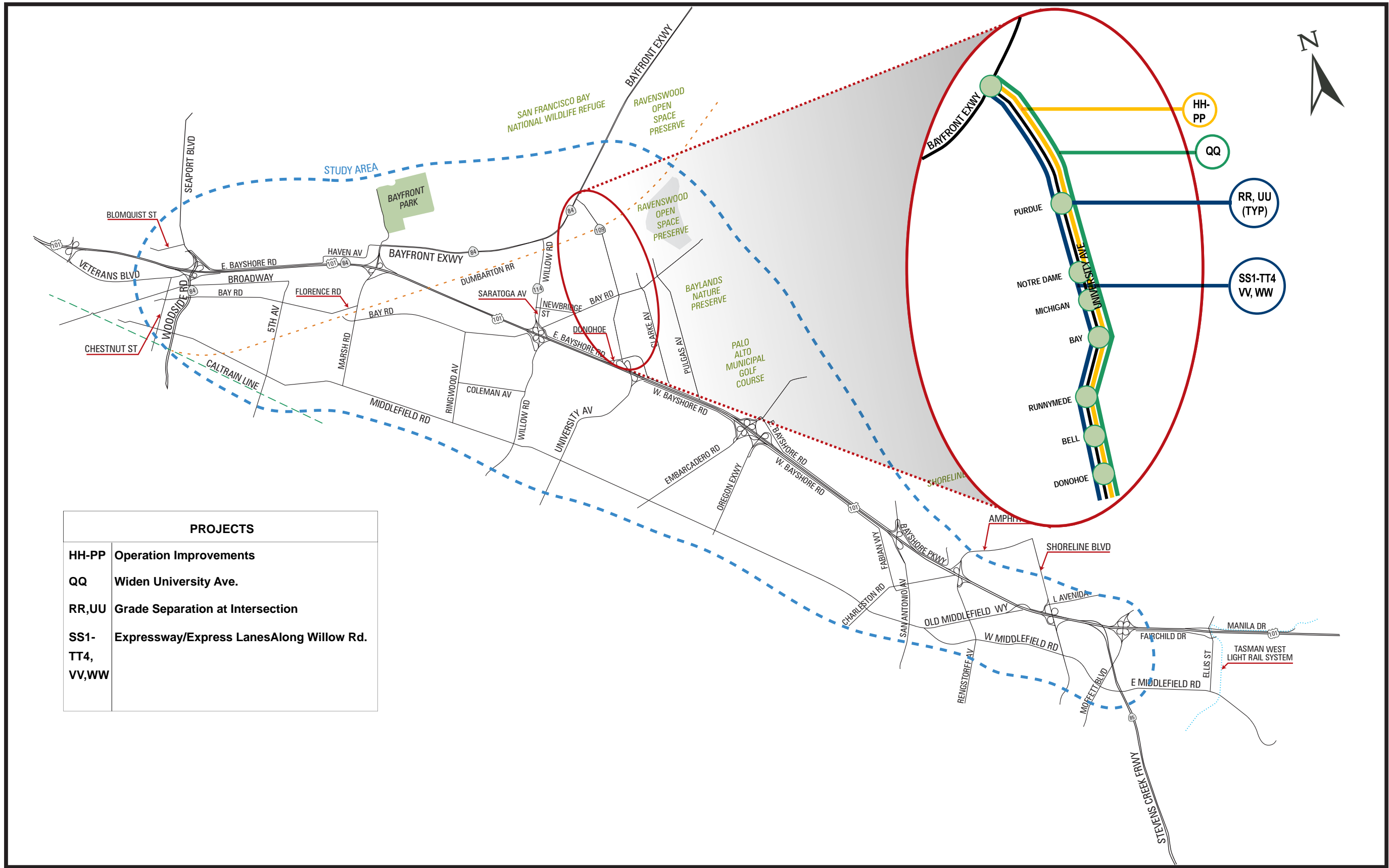
- ITS, including signage and electronic Fastrak-like systems that would be programmed to recognize local vehicles and identify (and cite) vehicles not technically permitted to use the restricted-access facilities

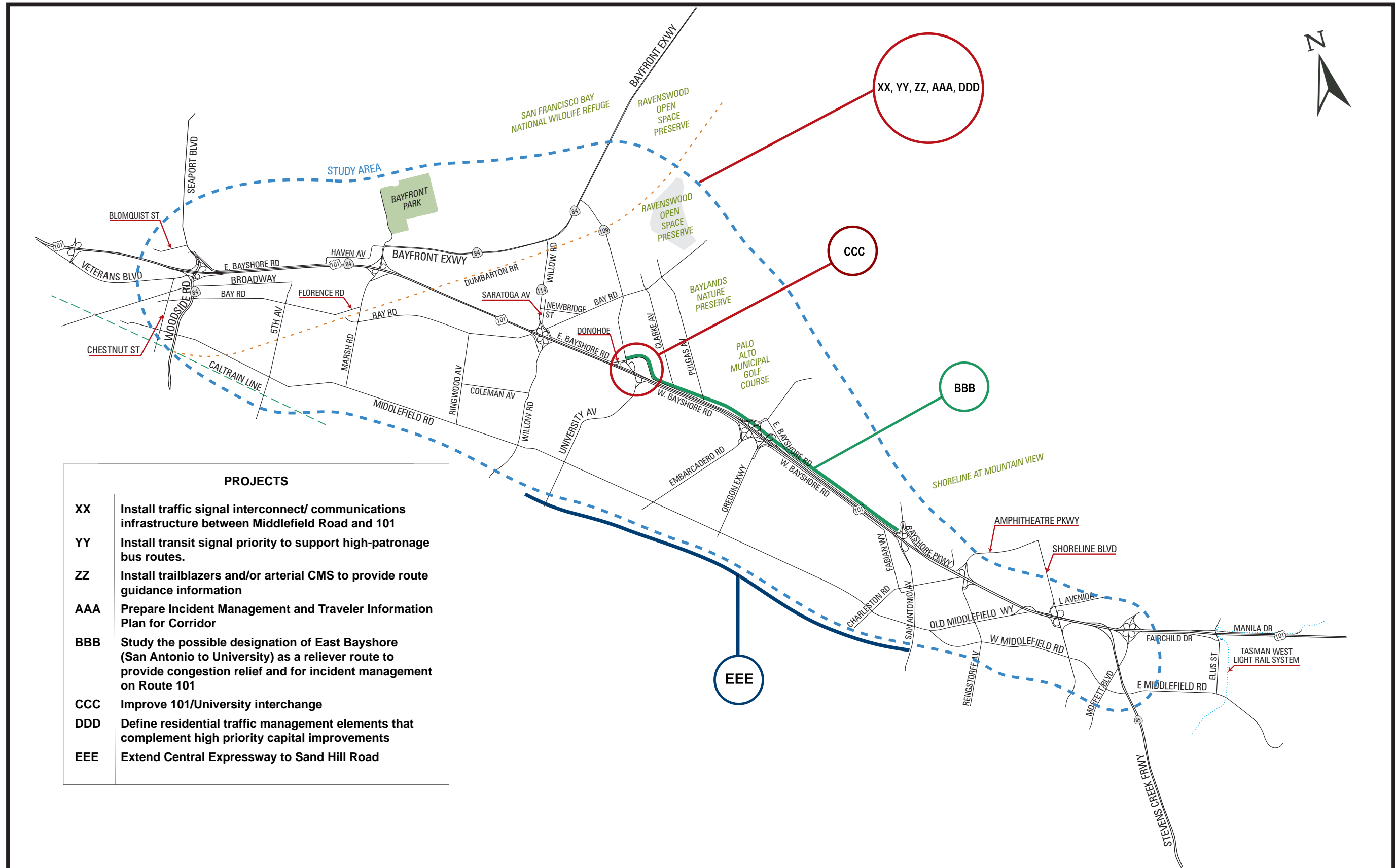
This process involved a facilitated series of presentations and discussions with the Technical Advisory Committee (TAC) and the Policy Advisory Committee (PAC) and resulted in 71 alternative improvements. These were compiled in a chart with respect to pros and cons, potential fatal flaws, relative costs, and implementation horizons, which were in turn reviewed with the TAC and the PAC. These alternatives are shown in **Figures 5A through 5E**, and are grouped geographically.











E. Assessment of Universe of Potential Solutions

Once the list of all possible alternatives was brainstormed, an assessment of relative benefits, costs, and impacts was conducted. The following tables summarize the assessment that utilized a simple “high-medium-low” approach.

- **Table 1A (left half): Highway 101**
 - Projects A and D1:
 - Both have 10-lane mainline cross-section
 - D1 requires reconstruction of interchanges
 - Projects D2 and E require substantial right-of-way, disruption
 - Project F may require right-of-way at conform locations
- **Table 1A (right half): Connection between Dumbarton Bridge and Highway 101**
 - Project H would have visual impact
 - Projects I and J would have similar benefits
 - Projects M and N would have significant impacts
 - Project P1 is not a traffic project so no traffic benefits are shown
- **Table 1B: Willow Road**
 - Several projects have small benefits and significant Environment impact
 - Widening and grade-separations, while beneficial, have significant impacts
 - Difference between CC and GG (express lanes) is primarily visual
- **Table 1C: University Avenue**
 - Several projects have small benefits and significant Environment impacts
 - Widening and grade-separations, while beneficial, have significant impacts
 - Difference between SS and WW (express lanes) is primarily visual
- **Table 1D (left side): Intelligent Transportation Systems (ITS)**
 - Complementary to physical expansion projects
 - Incident Management Study is nearing completion (sponsored by C/CAG).
- **Table 1D (right side): Other**
 - Two projects are studies
 - Central Expressway extension, while beneficial, would have significant impacts

| HIGHWAY 101 | | | | | | | | | |
|-------------|--|---------------------|---|--|----------------------------|--------------------|-------|-------------|--------------|
| ID Code | Alternative | Location | Traffic Benefits | | Construction Cost (2006\$) | Potential Impacts | | | |
| | | | Change in Roadway Congestion <i>(Expressed in ranges of travel time savings (min))</i> | Decrease commute traffic on residential streets? <i>(Expressed in ranges of peak period traffic volume)</i> | | Visual/ Aesthetics | Noise | Environment | Right-of-Way |
| A | Route 101 Auxiliary Lanes | MV, PA | See “Comparison” Chart (ALT 1) | | | | | | |
| B | Reconstruct Embarcadero/Oregon Interchange | MV, PA | ⊙ | ⊙ | \$\$\$ | ⊙ | ⊙ | ⊙ | ⊙ |
| C | Reconstruct San Antonio interchange and eliminate southbound on ramp at Charleston | MV, PA | ● | - | \$\$\$ | ⊙ | ⊙ | ⊙ | ⊙ |
| D1 | Widen freeway to 10 lanes (County Line to Shoreline) | MV, PA | ● | - | \$\$\$\$\$ | ⊙ | ⊙ | ⊙ | ⊙ |
| D2 | Widen freeway to 10 lanes + Aux Lanes (County Line to Shoreline) | MV, PA | ● | - | \$\$\$\$\$ | ○ | ⊙ | ○ | ○ |
| E | Widen freeway to 10 lanes + Aux Lanes (Whipple to County Line) | RC, MP, EPA, PA | ● | - | \$\$\$\$\$ | ○ | ⊙ | ○ | ○ |
| F | Route 101 Elevated Express Lanes | MV, PA, EPA, MP, RC | See “Comparison” Chart (ALT 2) | | | | | | |
| G | Improve local ability to cross 101 | MV, PA, EPA, MP, RC | - | - | \$ | - | - | ⊙ | ⊙ |

| CONNECTING BRIDGE AND HIGHWAY 101 | | | | | | | | | |
|-----------------------------------|---|----------|---|--|----------------------------|--------------------|-------|-------------|--------------|
| ID Code | Alternative | Location | Traffic Benefits | | Construction Cost (2006\$) | Potential Impacts | | | |
| | | | Change in Roadway Congestion <i>(Expressed in ranges of travel time savings (min))</i> | Decrease commute traffic on residential streets? <i>(Expressed in ranges of peak period traffic volume)</i> | | Visual/ Aesthetics | Noise | Environment | Right-of-Way |
| H | Grade Separations on Bayfront Expressway | EPA, MP | See “Comparison” Chart (ALT 3) | | | | | | |
| I | Extend Bayfront Expressway to Woodside Road | MP, RC | ● | ⊙ | \$\$\$ | ⊙ | ⊙ | ○ | ○ |
| J | Construct direct flyover connection between Bayfront/ Marsh and 101 north of Marsh | MP, RC | ⊙ | ⊙ | \$\$\$ | ○ | ⊙ | ⊙ | ○ |
| K | Elevated Direct Connections between Bayfront and 101 along Willow Road Corridor | EPA, MP | This project has been replaced by improvement CC | | | | | | |
| L | Elevated roadway along Dumbarton RR corridor between University and 101 | EPA, MP | ● | ⊙ | \$\$\$\$ | ○ | ⊙ | ○ | ⊙ |
| M | New 101 South connection through East Palo Alto (Expressway south of University) | EPA, MP | ● | ● | \$\$\$\$\$ | ○ | ○ | ○ | ○ |
| N | New 101 South connection skirting East Palo Alto (Expressway/viaduct along edge of bay) | EPA, PA | ● | ● | \$\$\$\$\$ | ○ | ⊙ | ○ | ○ |
| O | Tunnel beneath East Palo Alto | EPA | ● | ● | \$\$\$\$\$ | ● | ● | ● | ⊙ |
| P | San Francisquito Creek Diversion Structure and Roadway (dual use tunnel facility) | EPA, PA | ⊙ | ⊙ | \$\$\$\$ | ⊙ | ⊙ | ○ | ⊙ |
| P1 | Route 101 flood control project potentially down Willow Road. | EPA, MP | - | - | \$\$\$\$ | ⊙ | ⊙ | ○ | ⊙ |

| Location Key | | | | | |
|--------------|----------------|----|--------------|----|---------------|
| EPA | East Palo Alto | MP | Menlo Park | MV | Mountain View |
| PA | Palo Alto | RC | Redwood City | | |

| Construction Cost Key | | | | | |
|-----------------------|------------|----------|---------------|--------|--------------|
| \$\$\$\$\$ | >\$500M | \$\$\$\$ | \$200M-\$500M | \$\$\$ | \$50M-\$200M |
| \$ | \$1M-\$50M | | | | |

| ASSESSMENT KEY | | |
|----------------|-------------------|---|
| | TRAFFIC BENEFITS | POTENTIAL IMPACTS |
| ● | Improvement | Less-Than-Significant |
| ⊙ | Small Improvement | Less-Than-Significant <small>(w/ MITIGATION)</small> |
| ○ | Degrade | Significant |
| - | No Change | None |

| WILLOW ROAD | | | | | | | | | |
|-------------|--|----------|---|--|----------------------------|-------------------|-------|-------------|--------------|
| ID Code | Alternative | Location | Traffic Benefits | | Construction Cost (2006\$) | Potential Impacts | | | |
| | | | Change in Roadway Congestion <i>(Expressed in ranges of travel time savings (min))</i> | Decrease commute traffic on residential streets? <i>(Expressed in ranges of peak period traffic volume)</i> | | Visual/Aesthetics | Noise | Environment | Right-of-Way |
| Q | Short-term operational improvements on Willow Road | EPA, MP | See “Comparison” Chart (ALT 4) | | | | | | |
| R | Prohibit left turns during peak travel periods | EPA, MP | ⊙ | ⊙ | \$ | - | - | ⊙ | - |
| S | Prohibit local cross traffic during peak travel periods | EPA, MP | ⊙ | ⊙ | \$ | - | - | ○ | - |
| T | Exit/Entrance Right Turn pockets on Willow | EPA, MP | ⊙ | ⊙ | \$ | - | - | - | ⊙ |
| U | Set back curb line one lane width from traveled way at driveways | EPA, MP | ⊙ | ⊙ | \$ | - | - | ○ | ○ |
| V | Eliminate driveway access on Willow | EPA, MP | ⊙ | ⊙ | \$ | - | - | ○ | - |
| W | Eliminate selected signalized intersections: · Newbridge St · Ivy Dr · Hamilton Ave | EPA, MP | ⊙ | ⊙ | \$ | - | - | ○ | - |
| X | Eliminate signalized intersections and allow right turns only on/off Willow | EPA, MP | ⊙ | ⊙ | \$ | - | - | ○ | - |
| Y | Eliminate signalized intersections and prohibit any access from local streets | EPA, MP | ⊙ | ⊙ | \$ | - | - | ○ | - |
| Z | Widen Willow one lane each direction | EPA, MP | ● | ● | \$\$\$ | ○ | ⊙ | ○ | ○ |
| AA | Grade separations at selected intersections: · Newbridge St · Ivy Dr · Hamilton Ave | EPA, MP | ● | ● | \$\$\$\$ | ○ | ⊙ | ○ | ○ |
| BB | Pedestrian over crossing at Ivy Dr (near Mid-Peninsula High School) | EPA, MP | - | - | \$ | ○ | - | - | ⊙ |

| WILLOW ROAD (CONT'D) | | | | | | | | | |
|----------------------|---|----------|---|--|----------------------------|--------------------|-------|-------------|--------------|
| ID Code | Alternative | Location | Traffic Benefits | | Construction Cost (2006\$) | Potential Impacts | | | |
| | | | Change in Roadway Congestion <small>(Expressed in ranges of travel time savings (min))</small> | Decrease commute traffic on residential streets? <small>(Expressed in ranges of peak period traffic volume)</small> | | Visual/ Aesthetics | Noise | Environment | Right-of-Way |
| CC1 | Elevated viaduct expressway structure • 2 lanes in each direction | EPA, MP | ● | ⊙ | \$\$\$\$ | ○ | ⊙ | ⊙ | ○ |
| CC2 (Alt 6) | Elevated viaduct expressway structure • 1 lane in each direction | EPA, MP | See “Comparison” Chart (ALT 6) | | | | | | |
| CC3 | Elevated viaduct expressway structure • Reversible 2 lanes | EPA, MP | ● | ⊙ | \$\$\$\$ | ○ | ⊙ | ⊙ | ⊙ |
| CC4 | Elevated viaduct expressway structure • 3 lanes with reversible middle lane | EPA, MP | ● | ⊙ | \$\$\$\$ | ○ | ⊙ | ⊙ | ⊙ |
| DD1 | Depressed expressway • 2 lanes in each direction | EPA, MP | ● | ⊙ | \$\$\$\$ | ⊙ | ⊙ | ⊙ | ○ |
| DD2 | Depressed expressway • 1 lane in each direction | EPA, MP | ● | ⊙ | \$\$\$\$ | ⊙ | ⊙ | ⊙ | ⊙ |
| DD3 | Depressed expressway • Reversible 2 lanes | EPA, MP | ● | ⊙ | \$\$\$\$ | ⊙ | ⊙ | ⊙ | ⊙ |
| DD4 | Depressed expressway • 3 lanes with reversible middle lane | EPA, MP | ● | ⊙ | \$\$\$\$ | ⊙ | ⊙ | ⊙ | ⊙ |
| EE | Grade separations at all intersections (over crossings or under crossings) | EPA, MP | ● | ● | \$\$\$\$\$ | ○ | ⊙ | ○ | ○ |
| FF | Tunnel Expressway (maintaining existing facility at grade) | EPA, MP | ● | ● | \$\$\$\$ | ⊙ | ⊙ | ⊙ | ⊙ |
| GG | Willow Road Depressed/Cantilevered Express Lanes | EPA, MP | See “Comparison” Chart (ALT 7) | | | | | | |

| Location Key | | | | | Construction Cost Key | | | | |
|--------------|----------------|----------|---------------|--------|-----------------------|------|------------|----|--------------|
| EPA | East Palo Alto | MP | Menlo Park | MV | Mountain View | PA | Palo Alto | RC | Redwood City |
| \$\$\$\$ | >\$500M | \$\$\$\$ | \$200M-\$500M | \$\$\$ | \$50M-\$200M | \$\$ | \$1M-\$50M | \$ | <\$1M |

| ASSESSMENT KEY | | |
|----------------|-------------------|---|
| | TRAFFIC BENEFITS | POTENTIAL IMPACTS |
| ● | Improvement | Less-Than-Significant |
| ⊙ | Small Improvement | Less-Than-Significant <small>(w/ MITIGATION)</small> |
| ○ | Degrade | Significant |
| - | No Change | None |

| UNIVERSITY AVENUE | | | | | | | | | |
|-------------------|--|----------|---|--|----------------------------|--------------------|-------|-------------|--------------|
| ID Code | Alternative | Location | Traffic Benefits | | Construction Cost (2006\$) | Potential Impacts | | | |
| | | | Change in Roadway Congestion <i>(Expressed in ranges of travel time savings (min))</i> | Decrease commute traffic on residential streets? <i>(Expressed in ranges of peak period traffic volume)</i> | | Visual/ Aesthetics | Noise | Environment | Right-of-Way |
| HH | Short-term operational improvements on University Avenue | EPA | See “Comparison” Chart (ALT 7) | | | | | | |
| II | Prohibit left turns during peak travel periods | EPA | ☉ | ☉ | \$ | - | - | ☉ | - |
| JJ | Prohibit local cross traffic during peak travel periods | EPA | ☉ | ☉ | \$ | - | - | ○ | - |
| KK | Entrance/Exit Right Turn pockets on University | EPA | ☉ | ☉ | \$ | - | - | - | ☉ |
| LL | Set back curb line one lane width from traveled way at driveways | EPA | ☉ | ☉ | \$ | - | - | ○ | ○ |
| MM | Eliminate driveway access on University | EPA | ☉ | ☉ | \$ | - | - | ○ | - |
| NN | Eliminate selected signalized intersections: · Bell · Runnymede · Kavanaugh | EPA | ☉ | ☉ | \$ | - | - | ○ | - |
| OO | Eliminate signalized intersections and allow right turns only on/off University | EPA | ☉ | ☉ | \$ | - | - | ○ | - |
| PP | Eliminate signalized intersections and prohibit any access from local streets | EPA | ☉ | ☉ | \$ | - | - | ○ | - |
| QQ | Widen University one lane each direction | EPA | ● | ● | \$\$\$ | ○ | ☉ | ○ | ○ |
| RR | Grade separations at selected intersections: · Donohoe · Bay | EPA | ● | ● | \$\$\$\$ | ○ | ☉ | ○ | ○ |

| UNIVERSITY AVENUE (CONT'D) | | | | | | | | | |
|----------------------------|---|----------|---|--|----------------------------|--------------------|-------|--------------|--------------|
| ID Code | Alternative | Location | Traffic Benefits | | Construction Cost (2006\$) | Potential Impacts | | | |
| | | | Change in Roadway Congestion <small>(Expressed in ranges of travel time savings (min))</small> | Decrease commute traffic on residential streets? <small>(Expressed in ranges of peak period traffic volume)</small> | | Visual/ Aesthetics | Noise | Environ-ment | Right-of-Way |
| SS1 | Elevated expressway/viaduct along University corridor • 2 lanes each direction | EPA | ☉ | ● | \$\$\$\$ | ○ | ☉ | ☉ | ○ |
| SS2 | Elevated viaduct expressway structure • 1 lane in each direction | EPA | ○ | ● | \$\$\$\$ | ○ | ☉ | ☉ | ☉ |
| SS3 | Elevated viaduct expressway structure • Reversible 2 lanes | EPA | ☉ | ● | \$\$\$\$ | ○ | ☉ | ☉ | ☉ |
| SS4 | Elevated viaduct expressway structure • 3 lanes with reversible middle | EPA | ● | ● | \$\$\$\$ | ○ | ☉ | ☉ | ○ |
| TT1 | Depressed expressway • 2 lanes each direction | EPA | ☉ | ● | \$\$\$\$\$ | ☉ | ☉ | ☉ | ○ |
| TT2 | Depressed expressway • 1 lane in each direction | EPA | ○ | ● | \$\$\$\$\$ | ☉ | ☉ | ☉ | ☉ |
| TT3 | Depressed expressway • Reversible 2 lanes | EPA | ☉ | ● | \$\$\$\$\$ | ☉ | ☉ | ☉ | ☉ |
| TT4 | Depressed expressway • 3 lanes with reversible middle lane | EPA | ● | ● | \$\$\$\$\$ | ☉ | ☉ | ☉ | ○ |
| UU | Grade separations at all intersections (over crossings or under crossings) | EPA | ● | ● | \$\$\$\$\$ | ○ | ☉ | ○ | ○ |
| VV | Tunnel Expressway, (maintain exist- ing facility at grade) | EPA | ● | ● | \$\$\$\$\$ | ● | ● | ● | ☉ |
| WW | University Avenue Depressed/ Cantilevered Express Lanes | EPA | See “Comparison” Chart (ALT 9) | | | | | | |

| Location Key | | | | | Construction Cost Key | | | | |
|--------------|----------------|------------|---------------|--------|-----------------------|------|------------|----|--------------|
| EPA | East Palo Alto | MP | Menlo Park | MV | Mountain View | PA | Palo Alto | RC | Redwood City |
| \$\$\$\$\$ | >\$500M | \$\$\$\$\$ | \$200M-\$500M | \$\$\$ | \$50M-\$200M | \$\$ | \$1M-\$50M | \$ | <\$1M |

| ASSESSMENT KEY | | |
|----------------|-------------------|---|
| | TRAFFIC BENEFITS | POTENTIAL IMPACTS |
| ● | Improvement | Less-Than-Significant |
| ☉ | Small Improvement | Less-Than-Significant <small>(w/ MITIGATION)</small> |
| ○ | Degrade | Significant |
| - | No Change | None |

| INTELLIGENT TRANSPORTATION SYSTEMS (ITS) | | | | | | | | | |
|--|---|----------|---|--|----------------------------|-------------------|-------|--------------|--------------|
| ID Code | Alternative | Location | Traffic Benefits | | Construction Cost (2006\$) | Potential Impacts | | | |
| | | | Change in Roadway Congestion <small>(Expressed in ranges of travel time savings (min))</small> | Decrease commute traffic on residential streets? <small>(Expressed in ranges of peak period traffic volume)</small> | | Visual/Aesthetics | Noise | Environ-ment | Right-of-Way |
| XX | Install traffic signal interconnect/communications infrastructure on arterials between Middlefield Road | ALL | ⊙ | ⊙ | \$\$ | - | - | - | - |
| YY | Install transit signal priority to support high-patronage bus routes. | ALL | ⊙ | ⊙ | \$\$ | - | - | - | - |
| ZZ | Install trailblazers and/or arterial CMS to provide route guidance information | ALL | ⊙ | ⊙ | \$\$ | - | - | - | - |
| AAA | Prepare Incident Management and Traveler Information Plan for Corridor | ALL | ⊙ | ⊙ | \$ | - | - | - | - |

| OTHER | | | | | | | | | |
|---------|--|----------|---|--|----------------------------|-------------------|-------|-------------|--------------|
| ID Code | Alternative | Location | Traffic Benefits | | Construction Cost (2006\$) | Potential Impacts | | | |
| | | | Change in Roadway Congestion <small>(Expressed in ranges of travel time savings (min))</small> | Decrease commute traffic on residential streets? <small>(Expressed in ranges of peak period traffic volume)</small> | | Visual/Aesthetics | Noise | Environment | Right-of-Way |
| BBB | Study the possible designation of East Bayshore (San Antonio to University) as a reliever route to provide congestion relief and for incident management on Route 101 · Improve operations at intersections · Install directional signage to help keep commuters off residential streets | PA, EPA | - | - | \$ | - | - | - | - |
| CCC1 | Improve 101/University interchange · Construct Phase 2 improvements (Part A = SB direct connect off-ramp, Part B = Bike access) | PA, EPA | ⊙ | ⊙ | \$\$ | ● | ● | ● | ● |
| CCC2 | Improve 101/University interchange · Improve on-off connections for northbound traffic | PA, EPA | ⊙ | ⊙ | \$\$\$ | ⊙ | ⊙ | ⊙ | ⊙ |
| DDD | Define residential traffic management elements that complement high priority capital improvements | ALL | - | ● | \$ | - | - | ● | - |
| EEE | Extend Central Expressway to Sand Hill Road | PA | ● | ● | \$\$\$\$\$ | ○ | ○ | ○ | ○ |

| Location Key | | | | | |
|--------------|----------------|----|--------------|----|---------------|
| EPA | East Palo Alto | MP | Menlo Park | MV | Mountain View |
| PA | Palo Alto | RC | Redwood City | | |

| Construction Cost Key | | | | | |
|-----------------------|------------|----------|---------------|--------|--------------|
| \$\$\$\$\$ | >\$500M | \$\$\$\$ | \$200M-\$500M | \$\$\$ | \$50M-\$200M |
| \$\$ | \$1M-\$50M | \$ | <\$1M | | |

| ASSESSMENT KEY | | |
|----------------|-------------------|---|
| | TRAFFIC BENEFITS | POTENTIAL IMPACTS |
| ● | Improvement | Less-Than-Significant |
| ⊙ | Small Improvement | Less-Than-Significant <small>(w/ MITIGATION)</small> |
| ○ | Degrade | Significant |
| - | No Change | None |

II. Detailed Evaluation of Certain Solutions

A. Definition and Engineering of Solutions

Eight specific improvements were defined by consensus of the TAC and the PAC that were considered representative of the range of improvements that would address the study goals and should therefore be studied in more detail. These are summarized below.

[Note: This study defines Highway 101 as north-south and intersecting streets as east-west. Bayfront Expressway is also defined as east-west.]

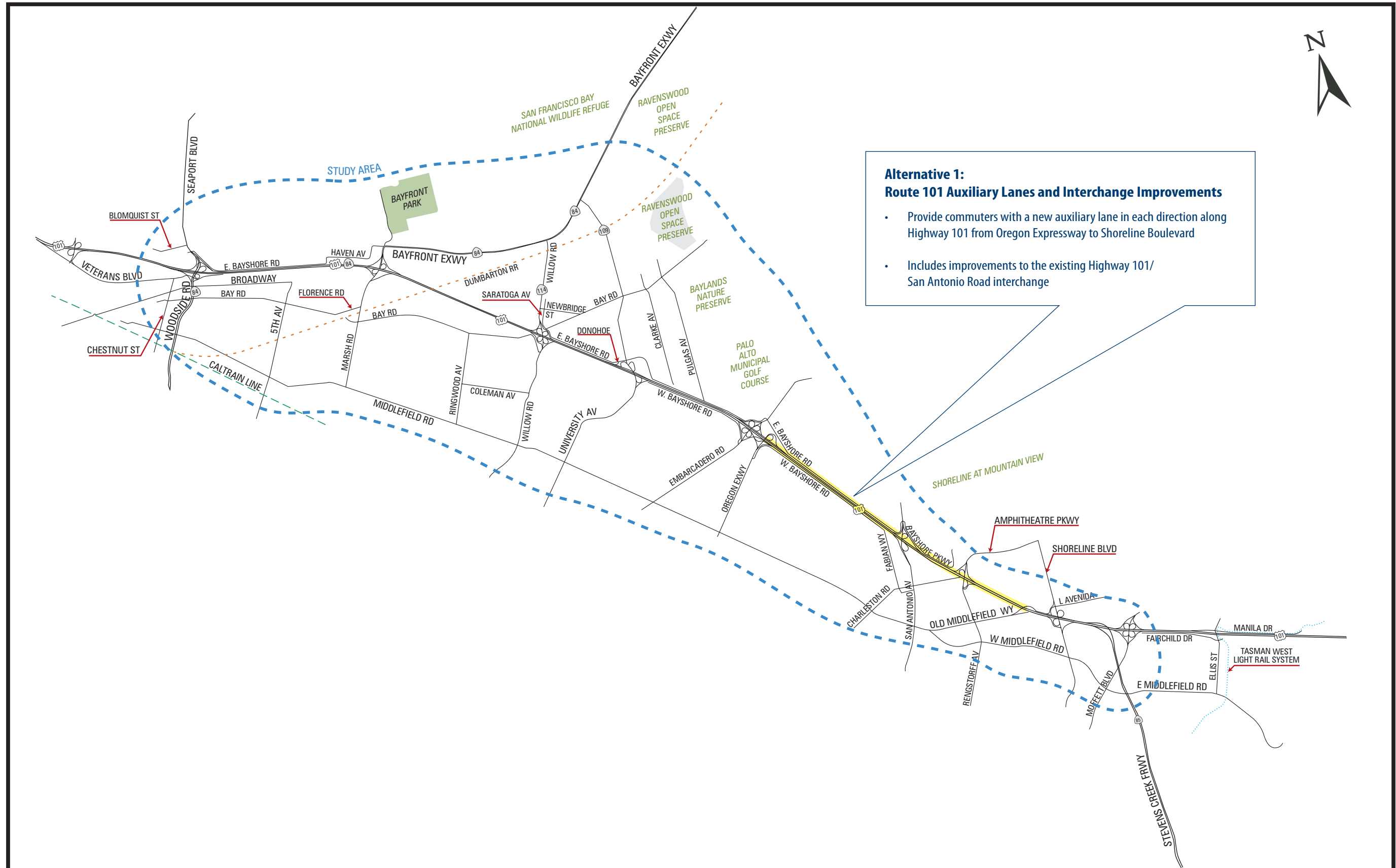
Alternative 1: Highway 101 Auxiliary Lanes and Interchange Improvements – This proposed alternative would provide commuters with a new auxiliary lane in each direction along Highway 101 from Oregon Expressway to Shoreline Boulevard. **Figure 6** illustrates the location of this improvement and Appendix D provides a conceptual sketch of the layout and cross section of this option. The roadway widening would require ramp modifications at existing interchanges, soundwalls, and the installation of longitudinal storm drainpipes on both sides of the highway to accommodate runoffs. These improvements would succeed the newly constructed auxiliary lanes from Hillsdale Boulevard to Marsh Avenue and also the future extension of the auxiliary lanes to Embarcadero Road proposed by the San Mateo County Transportation Authority.

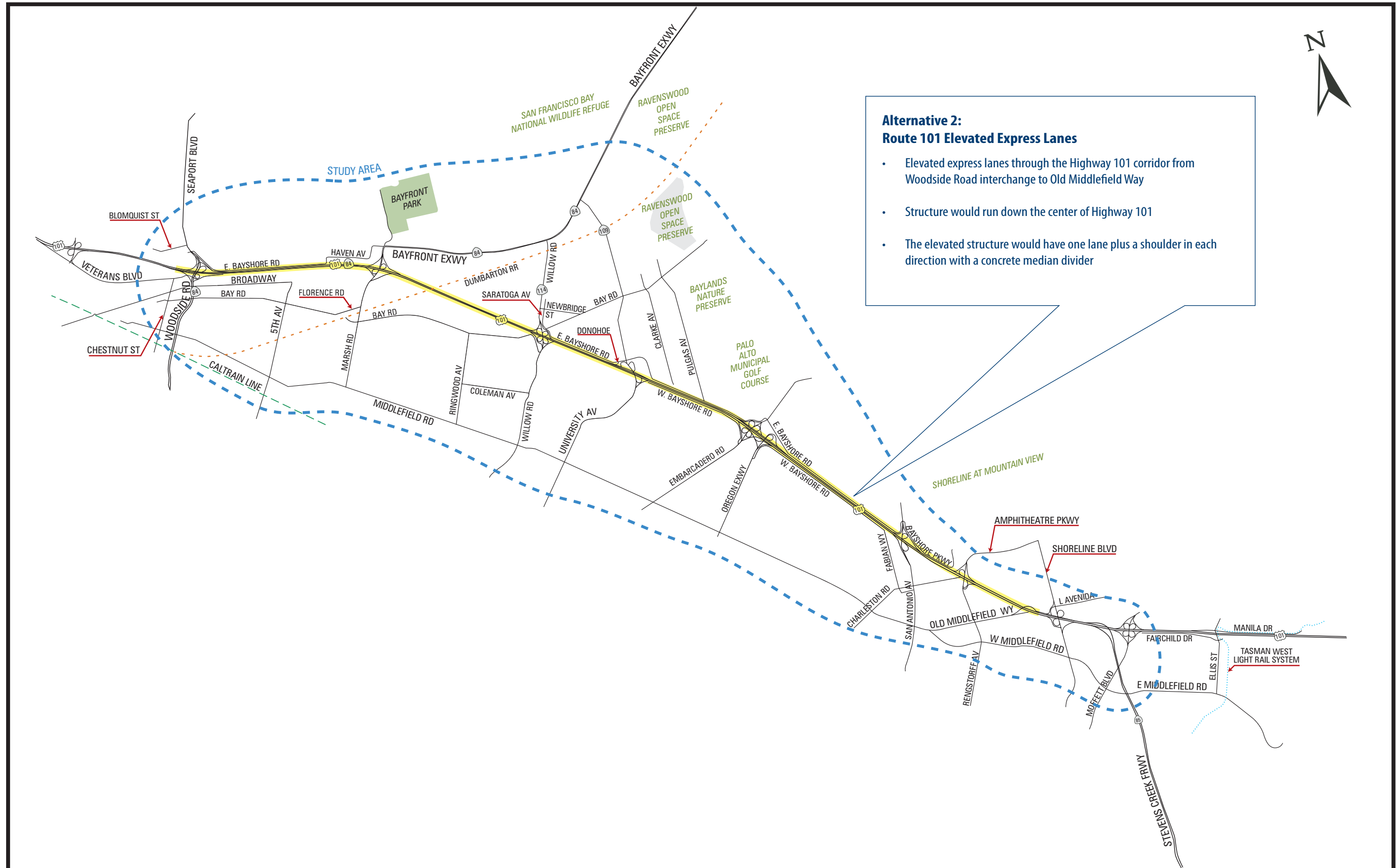
This alternative will include improvements to the existing Highway 101/San Antonio Road interchange. Currently there are no on-ramps to Highway 101 for commuters to San Jose. Commuters are forced to use Charleston Road, a local road that connects to Highway 101 at the Rengstorff Interchange.

One option is to remove the existing southbound loop off-ramp to provide room for a new southbound diagonal on-ramp onto Highway 101. A “T” intersection/ramp connection to San Antonio Road would accommodate a left turn movement for westbound commuters wanting to exit onto the highway. The impacts of this option will include the widening of the existing bridge crossing to allow for the left-turn lane. The addition of new storage lanes would require eastbound commuters on San Antonio Road to merge sooner prior to connecting to the southbound diagonal on-ramp to avoid backing up through traffic. Right-of-way would also be required along the west side of Highway 101 to allow room for the diagonal on-ramp connection.

In addition, the existing diagonal off-ramp from Highway 101 would be modified to also have a “T” intersection/ramp connection to the local road to provide left- and right-turn movements onto San Antonio Road.

Alternative 2: Highway 101 Elevated Express Lanes – This alternative would provide commuters with elevated express lanes through the Highway 101 corridor from Woodside Road Interchange to Old Middlefield Way. **Figure 7** illustrates the location of this improvement, which is shown in more detail in a sketch in Appendix





D. The elevated structure would run down the center of Highway 101, about 6 meters above grade at stretches between the interchanges, and would raise above all existing interchanges and railroad overcrossing to an approximated grade of 12 meters. The elevated structure would have one lane plus a shoulder in each direction with a concrete median divider.

At the north end connection, commuters going southbound would enter the Highway 101 off ramp to Woodside Road and connect via flyover ramp to the elevated structure. Commuters going northbound on the elevated structure would touch down via flyover ramp to Highway 101 just after the Woodside Road Interchange, merging into the existing auxiliary lane.

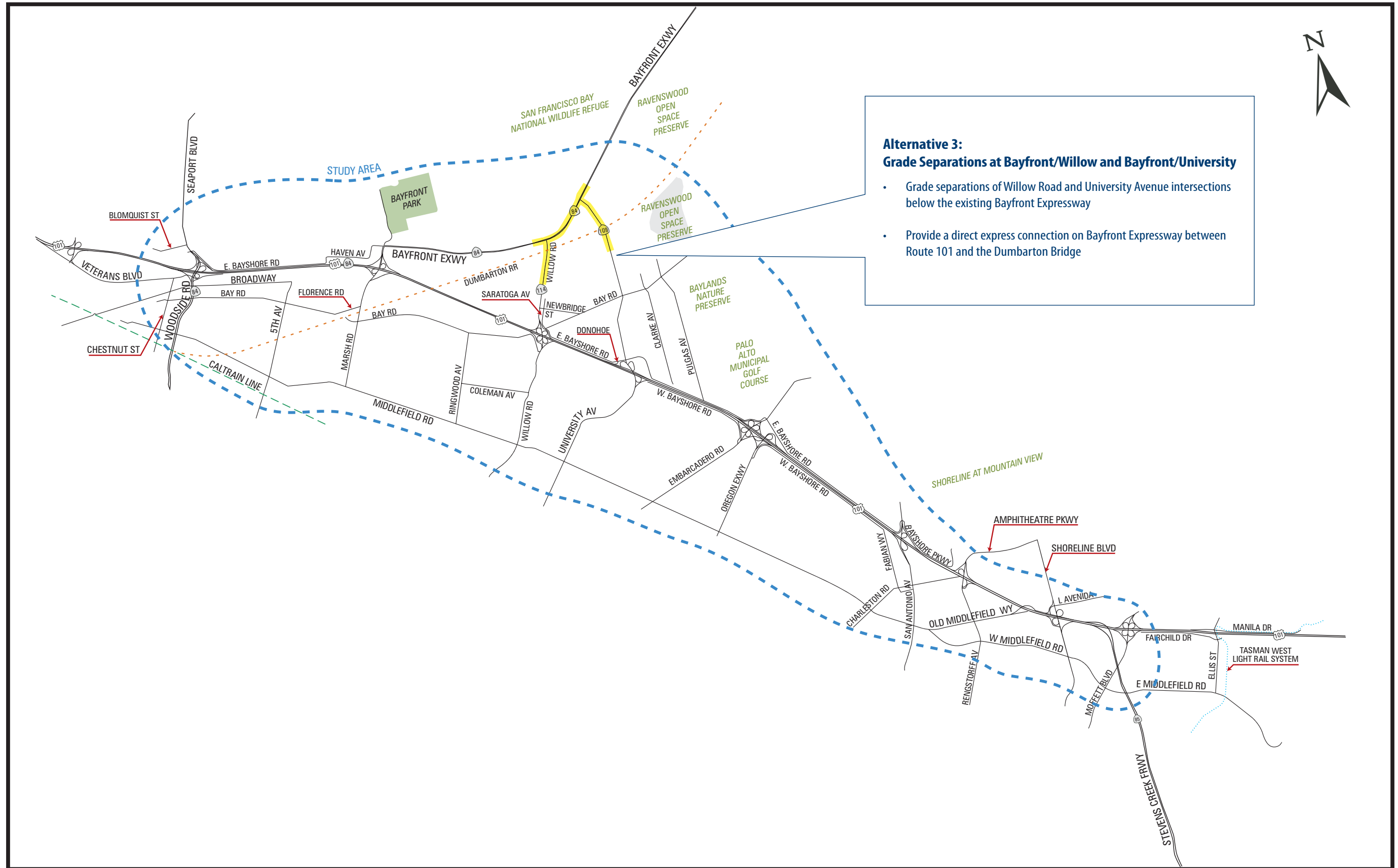
At the south end, commuters going northbound would connect via flyover ramp from the Old Middlefield Way Overcrossing to the elevated structure. Commuters going southbound on the elevated structure would touch down via flyover ramp to Highway 101, below the Old Middlefield Way Overcrossing and merging to an existing auxiliary lane.

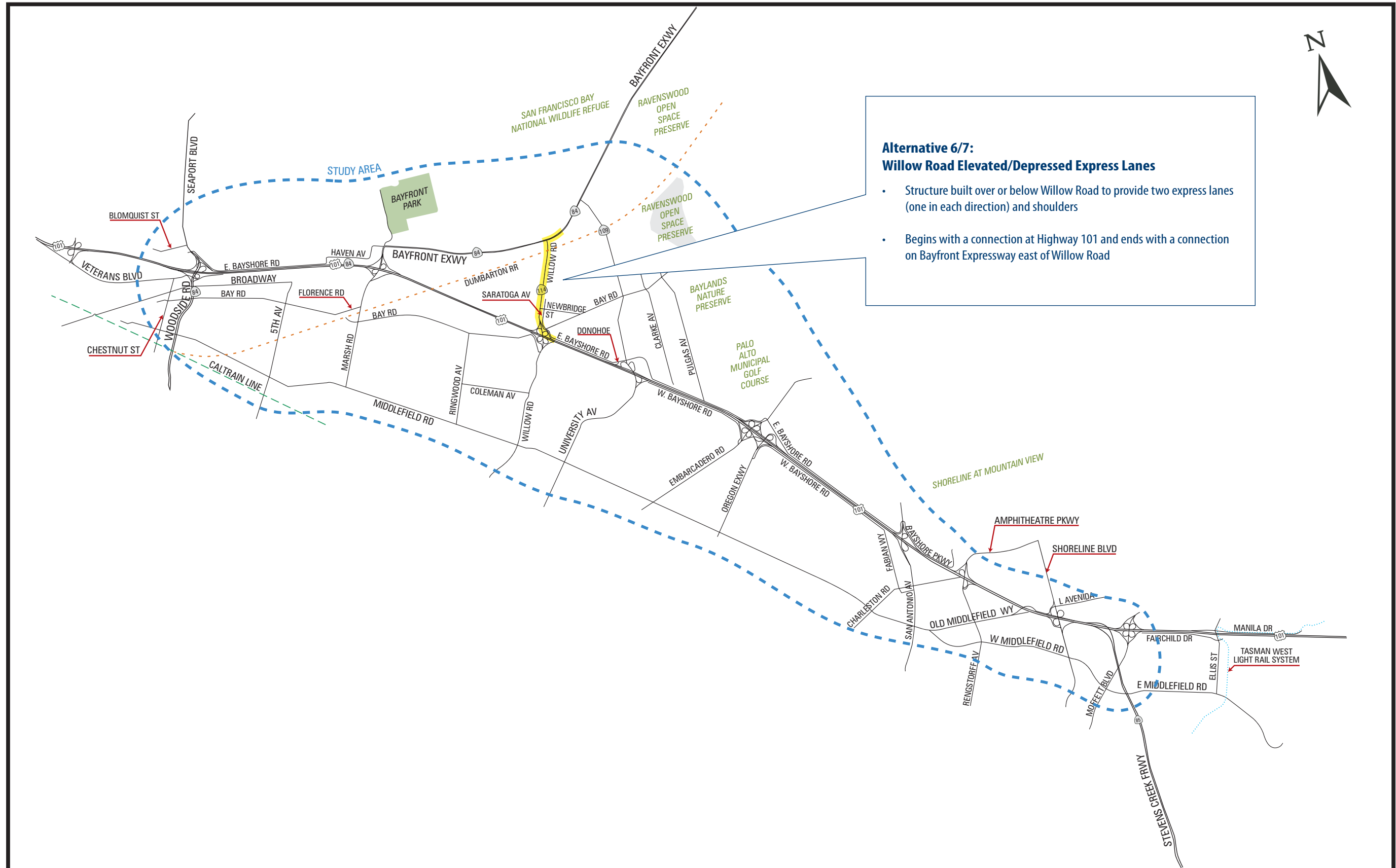
Additional right-of-way would be required where the flyover ramps touch down and merge to Highway 101.

Alternative 3: Grade Separations at Bayfront/Willow and Bayfront/University. This alternative would grade separate both Willow Road and University Avenue intersections below the existing expressway, essentially creating a freeway segment with full control of access that would benefit regional traffic connecting between the Dumbarton Bridge and Highway 101 in both directions. The location of this improvement is shown in **Figure 8**. Additional details are available in a sketch in Appendix D. The alternative would provide a direct express connection on Bayfront Expressway between Highway 101 and the Dumbarton Bridge, with uninterrupted traffic flow on the stretches of highway that would normally be delayed by signalized intersections at Willow Road and University Avenue. Also, this alternative would provide a direct connection from westbound Bayfront Expressway to Willow Road and Bayfront to University Avenue via flyover ramps. Although this alternative only includes a railroad grade separation on Willow Road at the Union Pacific/Dumbarton Rail tracks, a similar facility could be included at University. All other traffic would utilize the depressed intersections to make similar movements as they would now.

Alternative 6: Willow Road Elevated Express Lanes – This alternative would include an aerial structure over Willow Road to provide two express lanes (one each direction) and shoulders, beginning with an aerial connection at Highway 101 and ending with an aerial connection on Bayfront Expressway east of Willow Road.

Figure 9 shows the location of this improvement and the sketch in Appendix D provides more details. The intent of this improvement is to remove some bridge traffic from Willow Road, which would enhance local traffic access and operations as well as improve travel time for bridge traffic by reducing delay at intersections. The initial definition has the existing Willow Road remaining much the same as it is now





(four lanes with turn lanes), which is conservative given that four lanes at-grade may not be needed to serve local traffic.

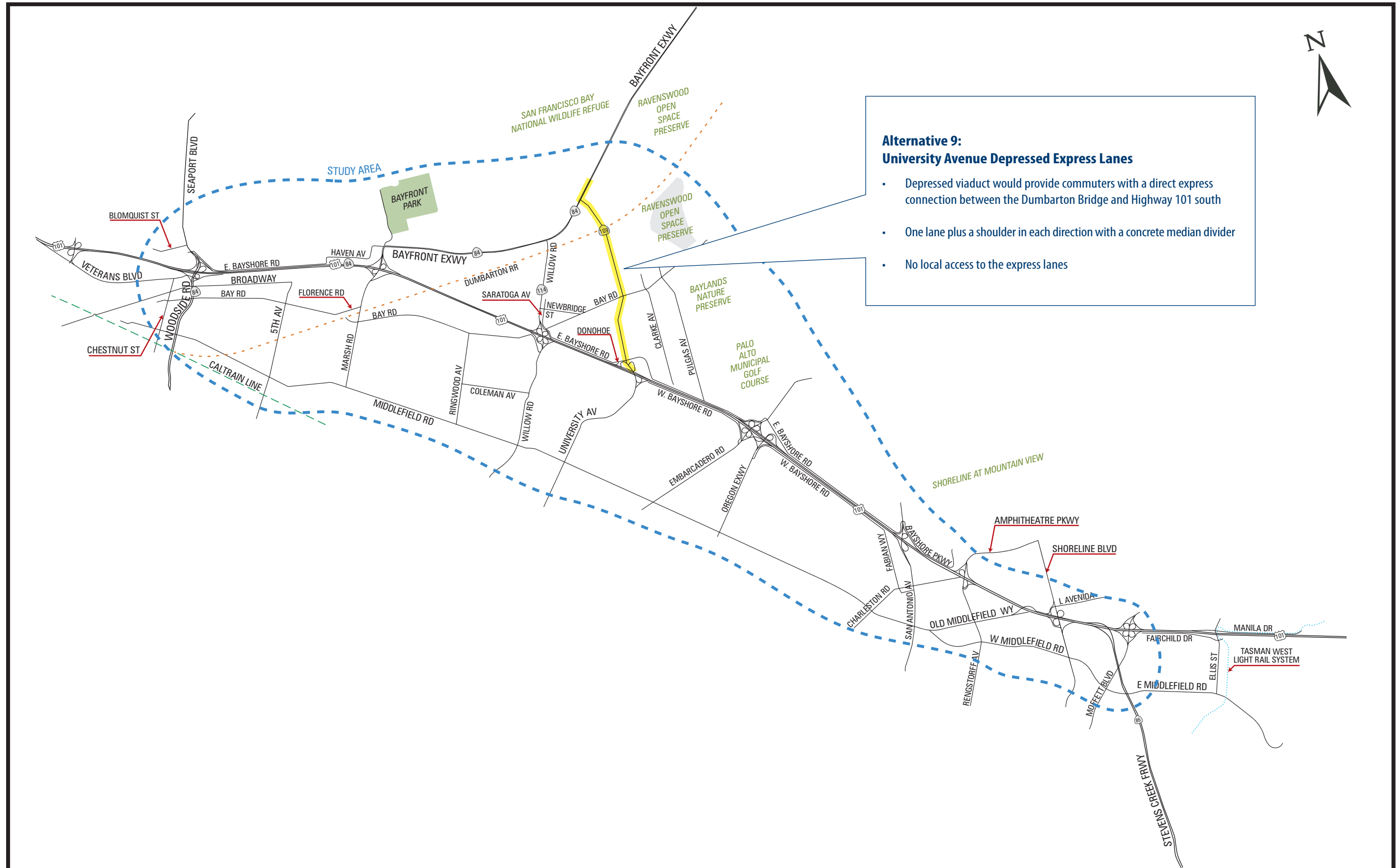
Right-of-way acquisition for this alternative would be minimal along Willow Road, although some property will be required near the Highway 101 and Bayfront Expressway conforms to provide for the aerial connections.

Alternative 7: Willow Road Depressed Express Lanes - This alternative, a variation of Alternative 6, would include a depressed trench structure below Willow Road to provide two express lanes (one each direction) and shoulders, beginning with underground portals at Highway 101 and ending with underground portals on Bayfront Expressway east of Willow Road. The intent of this improvement is to remove some bridge traffic from Willow Road, which would enhance local traffic access and operations as well as improve travel time for bridge traffic by reducing delay at intersections. The initial definition has the existing Willow Road remaining much the same as it is now (four lanes with turn lanes), which is conservative given that four lanes at-grade may not be needed to serve local traffic. This cross-section will require acquisition of right-of-way strips on each side of Willow Road, and near Highway 101 and Bayfront Expressway conforms to provide for the underground connections.

A second option, aimed at reducing right-of-way acquisition, would slide the surface lanes on each side of the viaduct partly over the viaduct via a cantilevered concrete “shelf” atop each retaining wall.

Alternative 9: University Avenue Depressed Express Lanes – This alternative would include a depressed viaduct through the University Avenue corridor would provide commuters with a direct express connection between the Dumbarton Bridge and Highway 101 south. The location of this alternative is shown in **Figure 10**, and additional details are contained in a sketch in Appendix D. The depressed viaduct would run down the center of University Avenue, about 6 meters below grade, from the Dumbarton Rail Corridor in the north to Bell Street in the south. At the north end, the depressed viaduct would rise up to grade between the railroad tracks and Bayfront Expressway and connect to Bayfront east via on and off direct-connect flyover ramps. At the south end, the viaduct would rise up to grade between Bell Street and Donohoe Street and connect to Highway 101 south via on and off direct-connect flyover ramps. Local streets would cross over the viaduct on at-grade bridges.

The viaduct would have one lane plus a shoulder in each direction with a concrete median divider. No local access would be provided to the viaduct. Due to the narrow public right-of-way along the University Avenue corridor, the depressed viaduct would require vertical retaining walls on each side. At the surface there would be a second lane in each direction, immediately adjacent to the top of each retaining wall, with shoulder and sidewalk for local traffic traveling along the University Avenue corridor. The local lanes would still connect directly to Bayfront Expressway and Donohoe



Street to allow for local access to the Dumbarton Bridge and Highway 101 as currently exists today.

With this configuration, a narrow strip of additional right-of-way would be required on each side of the existing University Avenue corridor. Right of way would also be required along the West Bayshore frontage road just south of the Highway 101/University Avenue interchange to allow room for the southbound flyover ramp to touch down. East Bayshore Road on the opposite side of Highway 101 would have to be narrowed to allow room for the northbound flyover ramp to exit Highway 101 on its way to the viaduct. At the north end of the viaduct, additional right-of-way would be required in the southeast quadrant of the University/Bayfront intersection for the flyover ramps. Some minor impacts would be expected on property that may be wetland where the flyover ramps touch down on either side of Bayfront Expressway.

A second option, evaluated to eliminate right-of-way take on University Avenue, would slide the surface lane on each side of the viaduct partly over the viaduct via a cantilevered concrete “shelf” atop each retaining wall. With this option, the right-of-way takes along University Avenue could be eliminated, but the right-of-way takes at each end would still be required.

B. Concept Level Cost Estimates

The Cost Estimate Summary Table summarizes the concept level cost estimates for the alternative projects in Year 2006 dollars. The cost estimate is broken down into three primary categories: (1) construction cost, (2) right of way cost, and (3) engineering support cost. Details of the cost estimating procedures and findings are included in **Appendix E**.

Cost Estimate Summary Table

| Alternative Name | Construction Cost | R/W Cost | Support Cost | Total Project Cost 2006 \$ |
|--|--------------------------|-----------------|---------------------|-----------------------------------|
| 1. Route 101 Auxiliary Lanes | \$57 M | \$20 M | \$28 M | \$105 M |
| 2. Route 101 Elevated | \$900 M | \$80 M | \$230 M | \$1,210 M |
| 3. Bayfront Expressway Grade Separations | \$180 M | \$67 M | \$86 M | \$333 M |
| 4. Willow Rd. Short Term | \$0.09 M | \$0 M | \$0.03 M | \$0.12 M |
| 6. Willow Rd. Elevated Express Lanes | \$96 M | \$33 M | \$46 M | \$175 M |
| 7. Willow Rd. Depressed w/ Cantilever | \$230 M | \$33 M | \$110 M | \$373 M |
| 8. University Ave. Short Term | \$0.18 M | \$ 0 M | \$0.09 M | \$0.27 M |
| 9. University Ave. Depressed w/ Cantilever | \$440 M | \$64 M | \$200 M | \$704 M |

C. Future Traffic Forecasts

A series of traffic forecasts, prepared by C/CAG through its Consultant, Hexagon Transportation Consultants, were conducted to establish no-build and build peak period traffic volumes and volume-to-capacity ratios for year 2025. The intent was to provide enough data to help evaluate the relative differences between alternatives and not provide all the details of the travel model network that Caltrans, for example, would need to evaluate no-build and build conditions for specific improvements in a formal Project Study Report (PSR) or Project Report/ Environmental Document (PR/ED) process. For reference, Appendix F presents the travel model results and a summary of the validation of base year conditions and future year 2025 results.

D. Traffic Benefits

The traffic forecasts were analyzed and reviewed with the TAC over several meetings, as is typical with efforts like this. The following points highlight the forecasted volumes and volume/capacity ratio changes under each "Build" alternative relative to "No-Build" conditions.

- **Alternative 1** would increase traffic volumes on Highway 101 where the auxiliary lanes are added and the net increase in capacity there would result in small reductions in v/c ratios. On balance, this indicates a net benefit.
- **Alternative 2** would increase Highway 101 traffic demand by 8,000 to 9,000 peak period vehicles in each direction -- in the express lanes -- and draw additional traffic demand to

Highway 101. Like in the at-grade lanes, volumes would exceed capacity in the express lanes. Small changes in volumes and v/c ratios are shown for the at-grade lanes on Highway 101. The increase in throughput would be a benefit, but the v/c ratios indicate continued delay for all vehicles. There is evidence that the model diverted some traffic from cross streets to the express lanes, which is to be expected given the express lanes provide enhanced travel time through a long segment of Highway 101 (see University Avenue, Embarcadero Road, and Oregon Expressway).

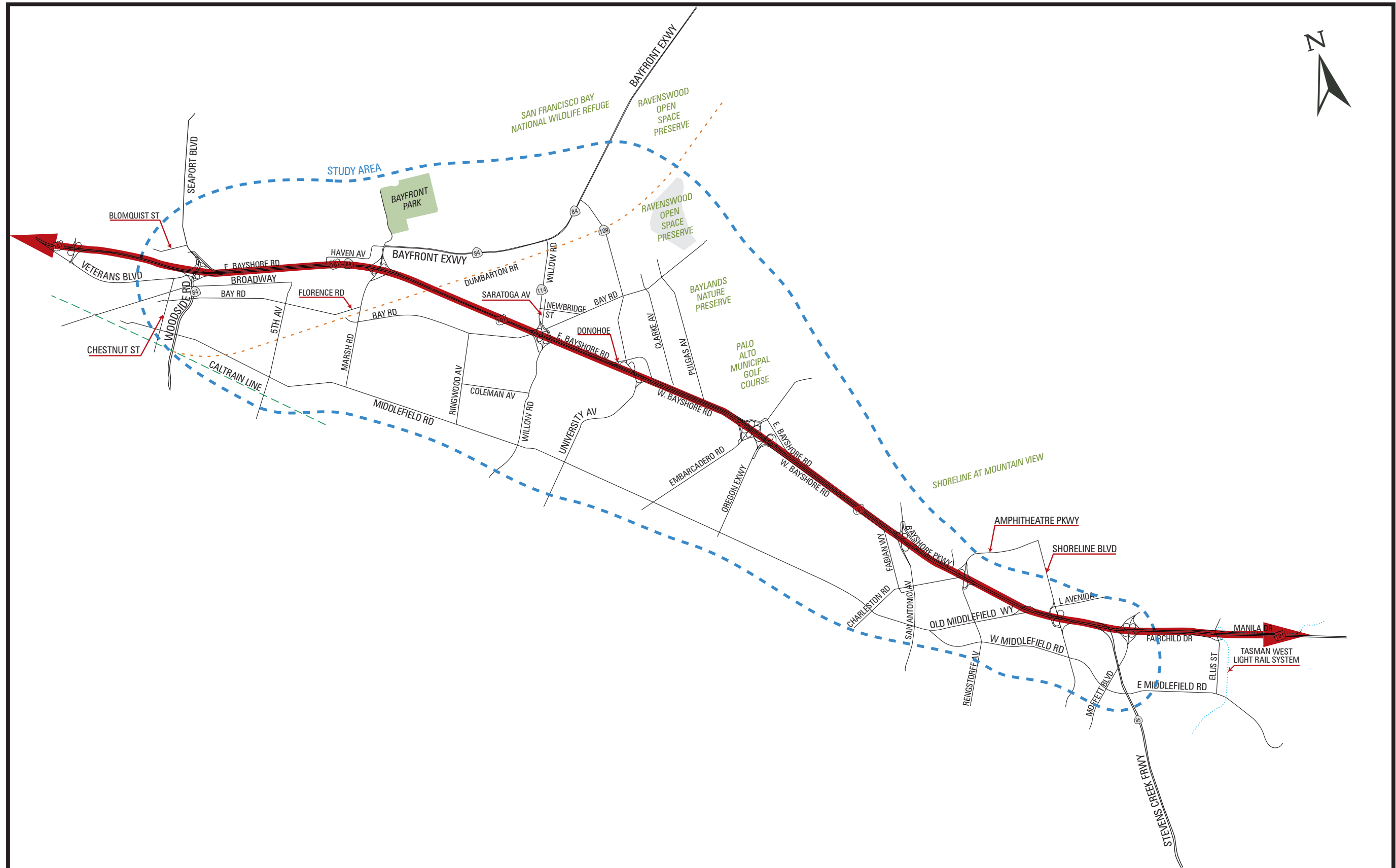
- **Alternative 3** would increase in peak period traffic on Bayfront Expressway east of University, on Willow Road during both peak periods, and on University Avenue in the a.m. peak period. The model also projected increases in peak period traffic on Clarke and Pulgas, which is evidence that additional capacity at the Bayfront Expressway intersections will draw traffic through residential streets as well as University Avenue. Corresponding changes in v/c ratios were noted.
- **Alternative 6 or 7** would result in a net increase in traffic on Willow Road due to the express lanes but decreases or small increases in at-grade traffic. Corresponding improvements are shown in v/c ratios for the at-grade facility. The express lanes do generate strong peak direction demands that exceed capacity, which suggests that additional capacity should be considered in the peak direction. Also noted are the reductions in peak period traffic and v/c ratios on University under these alternatives, which would be beneficial. Also notable are some small decreases in peak period traffic on Clarke and Pulgas.
- **Alternative 9** shows similar impacts on University as found for Willow under Alternatives 6/7 – net increases in total peak period traffic due to the express lanes and reductions in peak period traffic for the at-grade facility. Also noted are the reductions in traffic volumes and v/c ratios on Willow, which also are seen as beneficial, and more important to East Palo Alto, reductions in peak period traffic on Clarke and Pulgas.

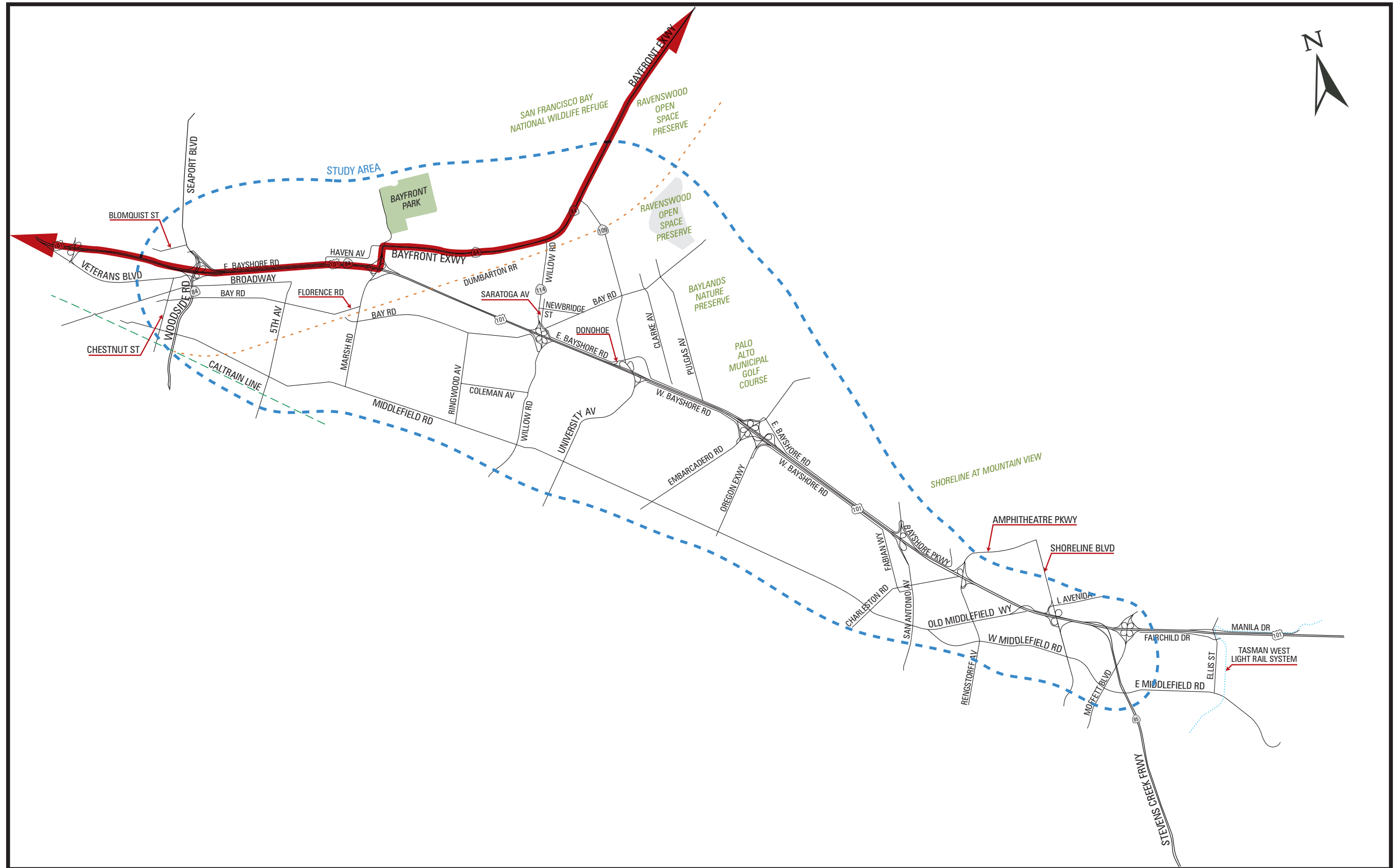
Generally, each alternative shows beneficial impacts compared to the no-build condition.

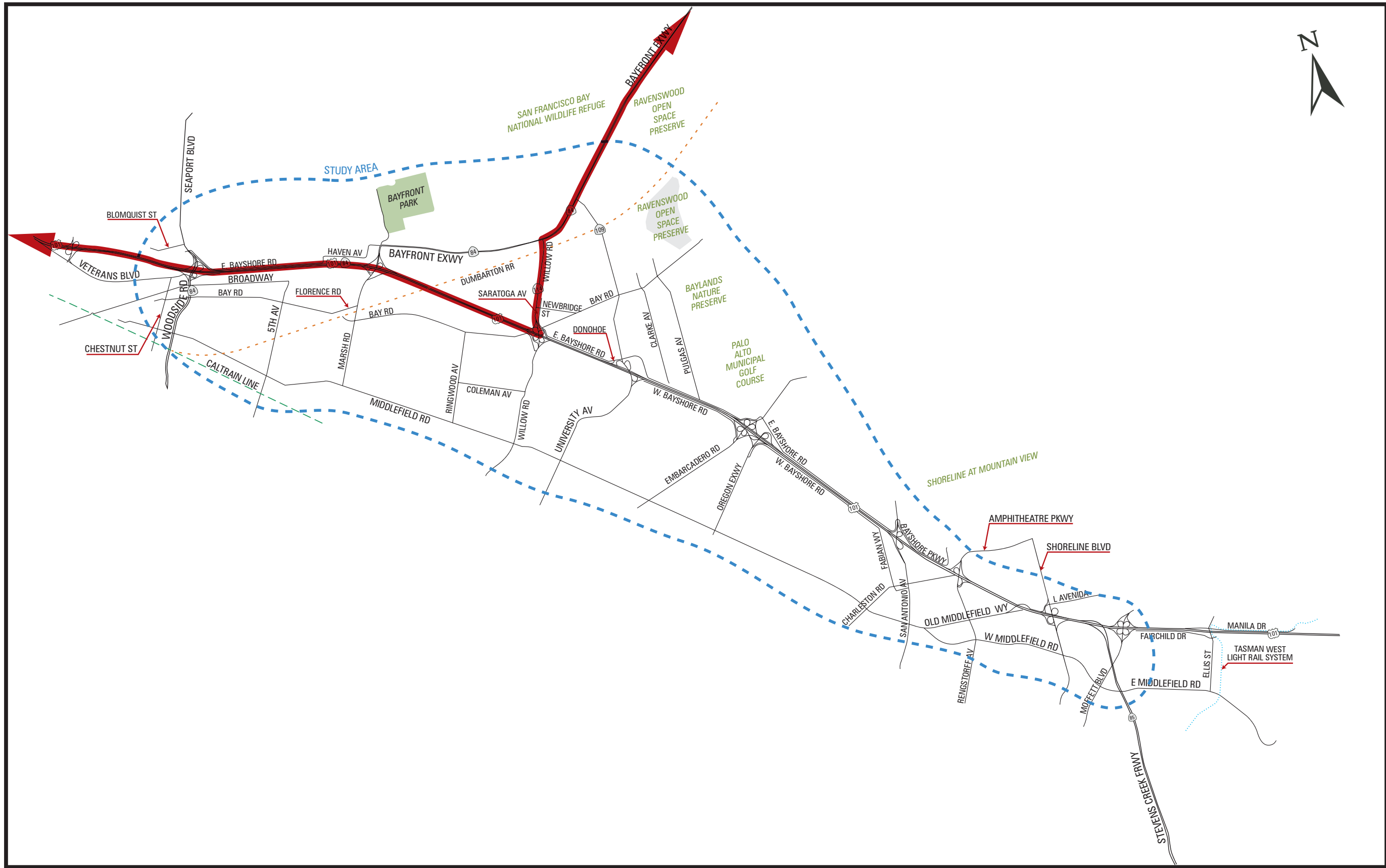
To further understand the potential impacts and benefits of these alternatives, a special traffic analysis tool called ALPS2000, which was developed by KHA, was used to evaluate typical performance measures, such as travel times, speeds, and delay, for key travel paths in the Study Area for a 24-hour period. **Figures 11 A through E** illustrate the travel paths that were evaluated, which reflect the key movements that this Study is addressing.

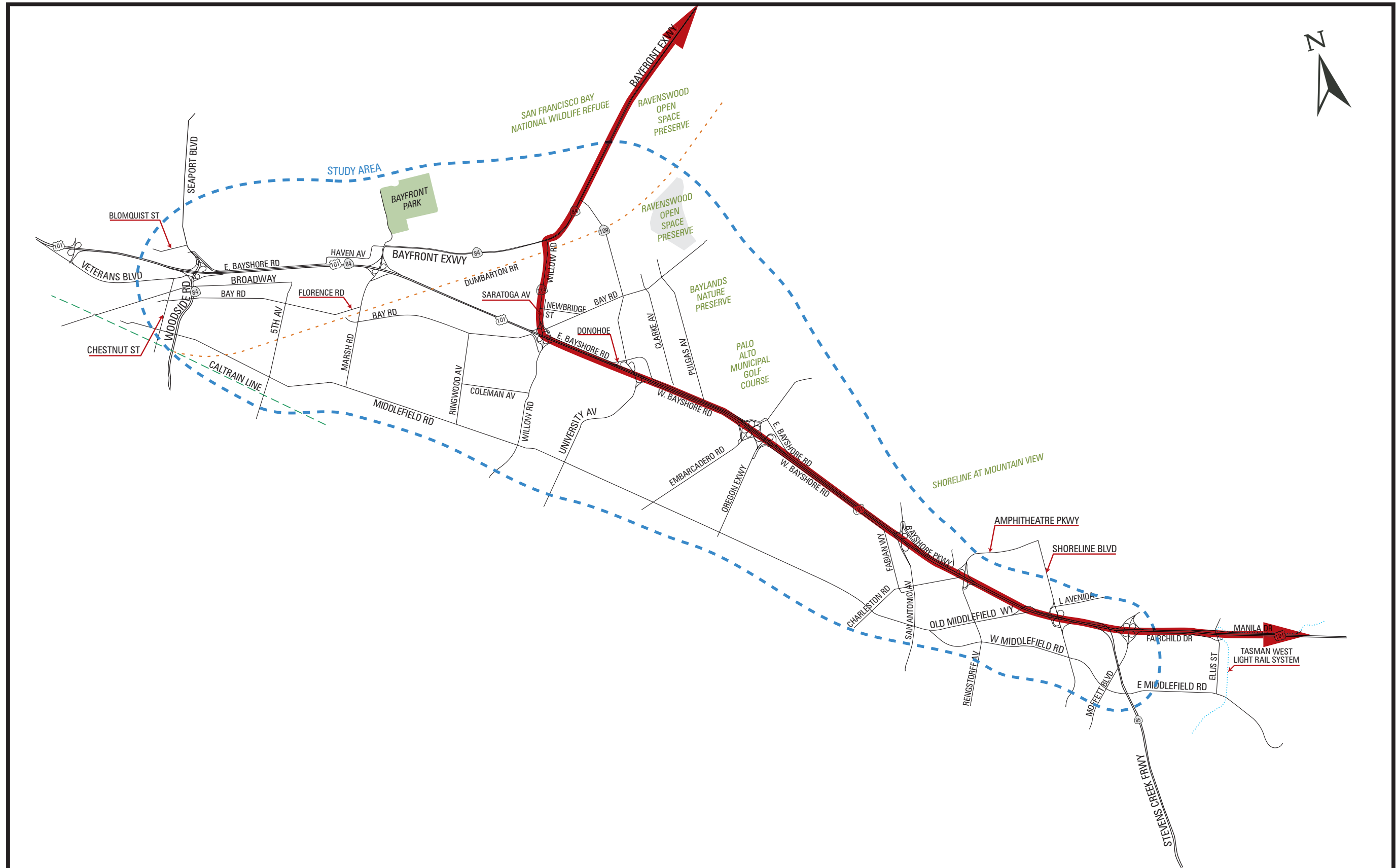
The preliminary results of this operational analysis indicated that travel time was the most important and easily understood measure. The following points summarize preliminary observations drawn from the travel time comparisons.

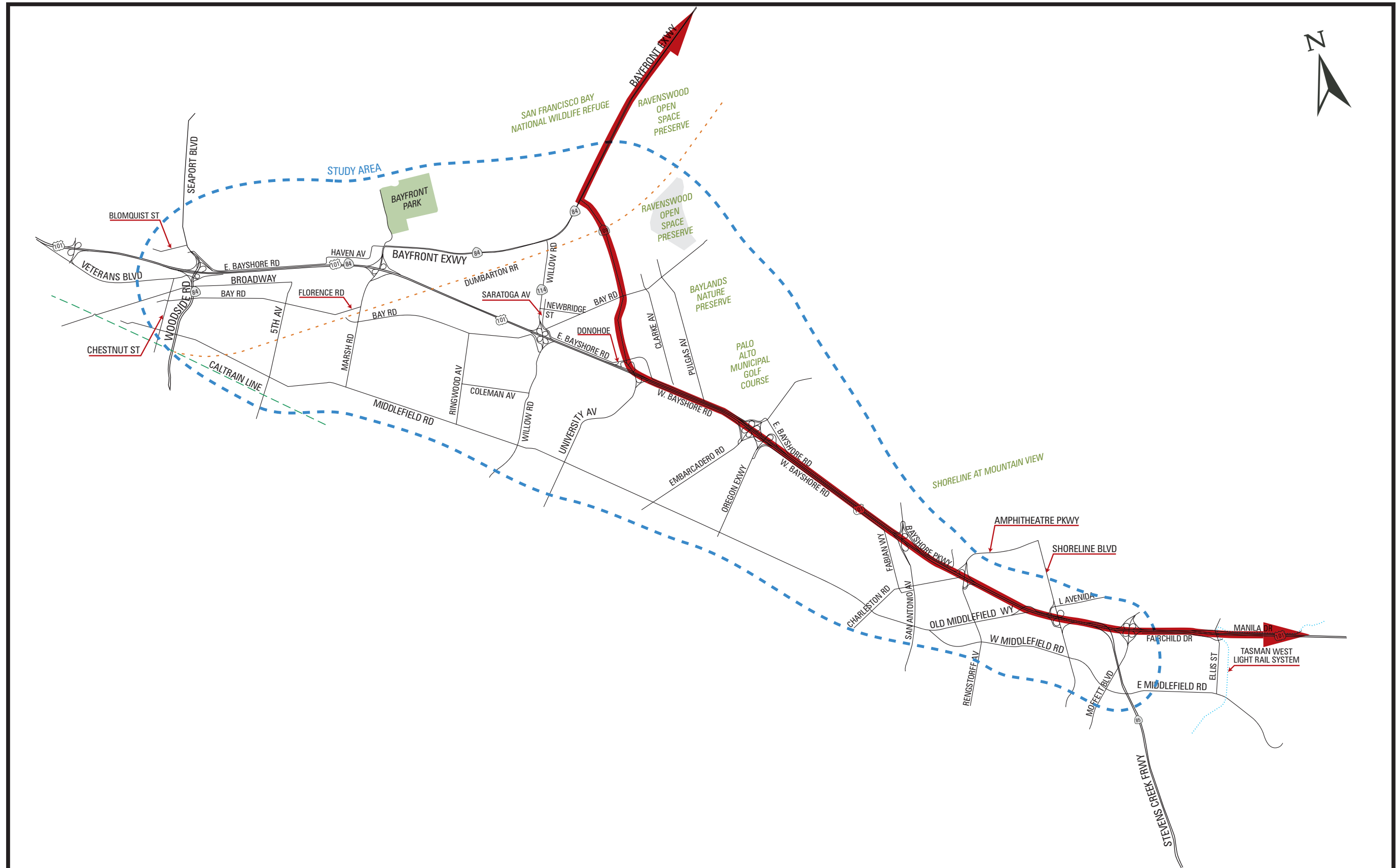
- Alternatives 1 and 2 show benefits on Highway 101.
- Alternative 3 shows benefits for movements to and from the bridge.
- Alternatives 6 & 7 show benefits for Willow Road traffic using the bridge.
- Alternative 9 shows benefits for University Avenue traffic using the bridge.











E. Potential Environmental and Social Impacts

This section discusses the potential environmental and social impacts of each alternative and **Table 2** summarizes these issues in a matrix form for easy comparison.

Alternative 1: Highway 101 Auxiliary Lanes. This alternative would construct auxiliary lanes on Highway 101 between Embarcadero Road in Palo Alto and Shoreline Boulevard in Mountain View. It would include modifications to the existing Highway 101/San Antonio Road interchange to allow access to southbound Highway 101 from San Antonio Road. Except at the San Antonio Road interchange, the work would occur within the existing freeway and adjacent frontage road rights-of-way.

Auxiliary lane projects of this type are quite common and typically result in non-significant environmental impacts or impacts that can be readily mitigated. Noise impacts are typically minimal. Existing soundwalls may be reconstructed or, where no soundwalls are present to protect sensitive receptors (e.g., residences), new soundwalls would be built.

Visual impacts would be negligible because no new structures would be constructed.

Additional right-of-way would be required to construct the new on-ramp to southbound Highway 101 at San Antonio Road. This right-of-way *may* impact an existing commercial building on Transport Street in Palo Alto.

This alternative *may* require the widening of the existing Highway 101 bridges over Adobe Creek and Matadero Creek. Depending upon the scope of the widening and the degree of impact existing vegetation, some replacement habitat may be required. Such mitigation is a standard requirement on many bridge widening projects and should not pose a significant constraint to this alternative.

Alternative 2: Highway 101 Elevated Express Lanes. This alternative would construct elevated express lanes on Highway 101 between Woodside Road in Redwood City and Old Middlefield Way in Mountain View. The elevated express lanes would be located above the median of the freeway, with an approximate height of 20 feet above existing grade between interchanges, rising to an approximate height of 40 feet above existing grade at interchanges and railroad crossings. Flyover ramps would be required at each end of the express lanes to provide a transition to/from the lanes. Except where the flyover ramps touch down and merge onto the Highway 101 freeway, the work would occur within the existing freeway and adjacent frontage road rights-of-way.

Construction of an elevated structure, roughly eight miles in length, with heights ranging from 20 to 40 feet, would create a significant and unmitigable visual impact. The visual impact would occur, not only for thousands of people who live and work along the Highway 101 corridor, but also for the users of the existing lanes on the freeway. The elevated structure would be visible well above the tops of existing

| ID Code | Alternative | Visual and Aesthetic | Noise | Biological Resources | Right-of-Way | Other Issues/Note(s) |
|---------|--|------------------------------------|--|--|---|--|
| 1 | Route 101 Auxiliary Lanes | Negligible impact | Minimal impact | Possible impact at crossing of Adobe & Matadero Creeks | One building may be impacted at 101/San Antonio interchange | Would likely qualify for a Mitigated Negative Declaration. |
| 2 | Route 101 Elevated Express Lanes | Significant and unmitigable impact | Significant impact; would require soundwalls on elevated structure | Possible impact at crossing of Adobe & Matadero Creeks | Minimal impact; no acquisition of businesses or residences | Major environmental issues; strong opposition likely; full EIR required. |
| 3 | Grade Separations on Bayfront Expressway | Less-than-significant impact | Less-than-significant impact | Impacts to wetlands at edge of Bay | Reconfiguration of access and parking at Sun Microsystems | Would impact recreational trail along Bayfront; BCDC permit needed; full EIR likely required. |
| 4 | Short-term operational improvements on Willow Road | None | None | None | None | Would likely qualify for a Categorical Exemption |
| 6 | Willow Road Elevated Express Lanes | Significant and unmitigable impact | Significant impact; would require soundwalls on elevated structure | Less-than-significant impact | Minimal impact; no acquisition of businesses or residences | Major environmental issues; strong opposition likely; full EIR required. |
| 7 | Willow Road Depressed/Cantilevered Express Lanes | Less-than-significant impact | Less-than-significant impact | Less-than-significant impact | Minimal impact; no acquisition of businesses or residences | Would impact Hetch-Hetchy pipelines; presence of Bay mud will affect trench design/cost; trench will need a system for dewatering of stormwater & groundwater; full EIR may be required. |
| 8 | Short-term operational improvements on University Avenue | None | None | None | None | Would likely qualify for a Categorical Exemption |
| 9 | University Avenue Depressed/Cantilevered Express Lanes | Less-than-significant impact | Less-than-significant impact | Some impact to wetlands at edge of Bay | Minimal impact; no acquisition of businesses or residences | Would impact Hetch-Hetchy pipelines; presence of Bay mud will affect trench design/cost; trench will need a system for dewatering of stormwater & groundwater; full EIR may be required. |

soundwalls (maximum soundwall heights are 16 feet), and would block or interfere with views from numerous locations. The elevated structure, in combination with the existing freeway, soundwalls, and overpasses, would constitute a significant visual and aesthetic barrier in the portions of Redwood City, Menlo Park, East Palo Alto, Palo Alto, and Mountain View through which the Highway 101 freeway passes. Signs and lighting on the structure would increase this impact, as would soundwalls, which are discussed in the following paragraph.

This alternative would likely result in significant noise impacts along the entire length of the express lanes because the lanes would be elevated substantially above the tops of existing soundwalls. Noise from traffic using these high-speed lanes would have a direct and generally unobstructed path into adjacent areas, such areas that include thousands of residences, as well as schools and parks. Soundwalls with heights of up to 12 feet could be constructed on the elevated structure, but such walls would exacerbate the above-described significant visual and aesthetic impacts of this alternative.

The additional right-of-way necessary at the two ends of the express lanes is not expected to require the acquisition of any residences or businesses.

This alternative *may* require the widening of the existing Highway 101 bridges over Adobe Creek and Matadero Creek. Depending upon the scope of the widening and the degree to which any existing vegetation may be impacted, some replacement habitat may be required. Such mitigation is a standard requirement on many bridge widening projects and should not pose a significant constraint to this alternative.

Alternative 3: Grade Separations on Bayfront Expressway. Alternative 3 would grade-separate the Bayfront Expressway intersections with Willow Road and University Avenue. The two intersections would be depressed below the existing expressway. Connections between the expressway and the local streets would be made with a combination of flyover ramps, ramps, and frontage roads. The entrances to the Sun Microsystems campus would be reconfigured to improve access to/from that facility. The existing crossing of the UPRR on Willow Road would be grade-separated.

The improvements contemplated under this alternative would occur in a non-residential area where the existing uses are industrial and open space/wetlands/parks. Right-of-way needed for the improvements would, as noted above, require a reconfiguration of access and parking at Sun Microsystems. Right-of-way required to grade-separate the University Avenue/Bayfront Expressway intersection and construct the necessary flyover ramps would most likely affect the adjacent wetlands. Given the ecological importance of these wetlands along the edge of San Francisco Bay, including the presence of several threatened/ endangered species, such impacts would be significant. Mitigation, typically in the form of replacement habitat, would be required. Wetlands impacts will require permits from and/or coordination with the Army Corps of Engineers (ACOE), U.S. Fish & Wildlife

Service (USFWS), California Department of Fish & Game (CDFG), and the Regional Water Quality Control Board (RWQCB).

The noise impacts of this alternative are not likely to be significant. This statement is based on 1) the lack of sensitive receptors adjacent to the improvements, and 2) the fact that portions of Willow Road and University Avenue will be depressed, which tends to reduce noise impacts.

Visual impacts will occur due to the need to construct flyover ramps at both Willow Road and University Avenue. However, such impacts would not likely be significant due to the lack of public vantage points in the area. For example, there are no adjacent residential areas where scenic views would be blocked by the elevated ramps.

The inclusion of pump stations at the depressed intersections will prevent roadway flooding.

There are existing paved recreational paths along both side of Bayfront Expressway in the vicinity of Willow Road and University Avenues. These paths would be impacted by the proposed improvements. Replacement paths will be required.

Portions of the improvements that are part of this alternative appear to be within the jurisdiction of the Bay Conservation and Development Commission (BCDC). BCDC jurisdiction includes all areas within 100 feet of the shoreline of San Francisco Bay. Therefore, a BCDC permit may be required in order to construct this alternative.

Alternative 6: Willow Road Elevated Express Lanes. This alternative would construct elevated express lanes on Willow Road between Highway 101 and the Bayfront Expressway. The elevated express lanes would be located on a structure above the median of Willow Road. The height of the structure would be approximately 20 feet above existing grade, except at the Highway 101/Willow interchange where a greater height would be required. Flyover ramps would be required at each end of the express lanes to provide a transition to/from the lanes. With the exception of where the flyover ramps touch down and merge onto Highway 101 and the Bayfront Expressway, the work would require only minimal right-of-way.

Similar to Alternative 2, construction of an elevated structure along Willow Road, roughly one mile in length, would create a significant and immitigable visual impact. The visual impact would occur, not only for people who live and work along the Willow Road corridor, but also for the users of the existing lanes on Willow Road. The elevated structure would be visible from the residences in Menlo Park and East Palo Alto that are located along Willow Road. The elevated structure would also be visible from the residences in Menlo Park and East Palo Alto that are located along Highway 101 near the Highway 101/Willow Road interchange. In addition to the visual effect, such structures tend to exacerbate the “divided feeling” that occurs when major transportation facilities transect local communities. Signs and lighting on the structure

would increase this impact, as would soundwalls, which are discussed in the following paragraph.

This alternative would likely result in significant noise impacts along the entire length of the express lanes because the lanes would be elevated substantially above existing grade. Noise from traffic using these high-speed lanes would have a direct and generally unobstructed path into adjacent areas, such areas which include hundreds of residences. Soundwalls with heights of up to 12 feet could be constructed on the elevated structure, but such walls would emphasize the above-described significant visual and aesthetic impacts of this alternative.

The additional right-of-way necessary at the two ends of the express lanes is not expected to require the acquisition of any residences or businesses.

Alternative 7: Willow Road Depressed Express Lanes with Cantilevered Frontage. This alternative would construct depressed express lanes on Willow Road, partly sliding the surface lanes over the top of the trench containing the express lanes, which is presently the median of Willow Road. The cantilevering of the lanes partially over the trench would reduce the cross-section, which in turn, would reduce right-of-way requirements.

A substantial loss of parking along both sides of Willow Road would be largely avoided with this alternative given the cantilever design. Further, impacts to existing trees and landscaping would also be reduced.

Noise impacts would be largely self-mitigating because the walls of the trench would function like soundwalls. This is based also on the fact that the lanes carrying local traffic would not be as close to the adjacent land uses.

By depressing the express lanes, there would be no significant visual and aesthetic impact. However, the depressed express lanes would conflict with the Hetch-Hetchy Water Lines, which cross under Willow Road at Ivy Drive. The water lines would need to be relocated. A trench would require a system of drains and pump stations for the removal of stormwater, as well as to mitigate for the effects of high groundwater.

The presence of Bay muds along the alignment, soils that are relatively unstable, means that additional measures will need to be considered for the purpose of engineering a safe facility. Although this condition would not preclude the construction of this alternative, the engineering solutions could be costly.

Any archaeological sites located along this corridor would likely sustain greater impacts with a depressed alternative than with an elevated design. According to the regional clearinghouse located at Sonoma State University, there are such sites located in the area. However, the importance of these sites, as well as any impacts to them, cannot be ascertained without further study.

Alternative 9: University Avenue Depressed Express Lanes with Cantilevered Frontage. This alternative would construct depressed express lanes on University

Avenue, partly sliding the surface lanes over the top of the trench containing the express lanes. The cantilevering of the lanes partially over the trench would reduce the cross-section, which in turn, would reduce right-of-way requirements.

Noise impacts would be largely self-mitigating because the walls of the trench would function like soundwalls. This is based also on the fact that the lanes carrying local traffic would not be as close to the adjacent land uses.

By depressing the express lanes, there would be no significant visual and aesthetic impact. However, the depressed express lanes would conflict with the Hetch-Hetchy Water Lines, which cross under University Avenue east of Bay Road. The water lines would need to be relocated. A trench would require a system of drains and pump stations for the removal of stormwater, as well as to mitigate for the effects of high groundwater.

Depending upon the footprint and design of the new ramps that will connect the express lanes to Bayfront Expressway, some impacts to adjacent wetlands may occur. Although such impacts would not likely be extensive, the filling of any wetlands at this location would be significant and mitigation would be required. Wetlands impacts will require permits and/or coordination with the ACOE, USFWS, CDFG, and the RWQCB.

The presence of Bay muds along the alignment, soils that are relatively unstable, means that additional measures will need to be considered for the purpose of engineering a safe facility. Although this condition would not preclude the construction of this alternative, the engineering solutions could be costly.

Any archaeological sites located along this corridor would likely sustain greater impacts with a depressed alternative than with an elevated design. According to the regional clearinghouse located at Sonoma State University, there are such sites located in the area. However, the importance of these sites, as well as any impacts to them, cannot be ascertained without further study.

The eastern portion of this alternative appears to be within 100 feet of the shoreline of the Bay. Therefore, a BCDC permit will likely be required.

F. Comparison of Solutions

Having completed assessments of traffic benefits, cost estimates, and potential environmental impacts, a comparison chart was created to show contrast between the alternatives. This comparison is summarized in **Table 3**.

The following points summarize observations drawn from this effort.

- Highway 101 Auxiliary lanes show benefit in the northbound direction and with respect to commute traffic on residential streets, and minimal environment impacts.
- Highway 101 Express Lanes show significant travel time benefits, high costs and some significant visual/aesthetic impacts.

| ID Code | Alternative | Location | Traffic Benefits | | | Cost Estimate Summary (2006\$) | | | | Potential Environmental Impacts by Alternative | | | | |
|---------|--|---------------------|---|---|----------------|--------------------------------|-------------------|--------------|--------------------|--|--|--|---|---|
| | | | Change in Vehicle Hours of Travel <i>(Typical weekday, 6 a.m. to 6 p.m.)</i> | Decrease commute traffic on residential streets? <i>(Expressed change in peak period traffic volume)</i> | | Construction Cost | Right-of-Way Cost | Support Cost | Total Project Cost | Visual/ Aesthetics | Noise | Biological Resources | Right-of-Way | Other Issues |
| | | | | Clarke | Pulgas | | | | | | | | | |
| 1 | Route 101 Auxiliary Lanes | MV, PA | -4,135 | -200 (-10%) | -100 (-10%) | \$57 M | \$20 M | \$28 M | \$105 M | Negligible Impacts | Minimal Impact | Possible impact at crossing of Adobe & Matadero Creeks | One building may be impacted at 101/San Antonio interchange | Would likely qualify for an Mitigated Negative Declaration |
| 2 | Route 101 Elevated Express Lanes | MV, PA, EPA, MP, RC | -18,472 | 0 | 0 | \$900 M | \$80 M | \$230 M | \$1,210 M | Significant and unmitigable impact | Less than significant impact given soundwalls would be built on elevated structure | Possible impact at crossing of Adobe & Matadero Creeks | Minimal impact; no acquisition of businesses or residences | Major environmental issues; strong opposition likely; full EIR required |
| 3 | Grade Separations on Bayfront Expressway | EPA, MP | -7,811 | +200 (+10%) | +100 (+10%) | \$180 M | \$67 M | \$86 M | \$333 M | Less-than-significant impact | Less-than-significant impact | Impacts to wetlands at edge of Bay | Reconfiguration of access and parking at Sun Microsystems | Would impact recreational trail along Bayfront; BCDC permit needed; full EIR likely required |
| 4 | Short-term operational improvements on Willow Road | EPA, MP | minor | minor | minor | \$0.09 M | \$0 M | \$0.03 M | \$0.12 M | None | None | None | None | Would likely qualify for a Categorical Exemption |
| 6 | Willow Road Elevated Express Lanes | EPA, MP | -4,945 | -100 (-5%) | -100 (-10%) | \$96 M | \$33 M | \$46 M | \$175 M | Significant and unmitigable impact | Significant impact; would require soundwalls on elevated structure | Less-than-significant impact | Minimal impact; no acquisition of businesses or residences | Major environmental issues; strong opposition likely; full EIR required |
| 7 | Willow Road Depressed/ Cantilevered Express Lanes | EPA, MP | Same as Alt 6 | Same as Alt 6 | Same as Alt 6 | \$230 M | \$33 M | \$110 M | \$373 M | Less-than-significant impact | Less-than-significant impact | Less-than-significant impact | Minimal impact; no acquisition of businesses or residences | Would impact Hetch- Hetchy pipelines; presence of Bay mud will affect trench design/cost; trench will need a system for dewatering of storm water & groundwater; full EIR may be required |
| 8 | Short-term operational improvements on University Avenue | EPA | minor | minor | minor | \$0.18 M | \$0 M | \$0.09 M | \$0.27 M | None | None | None | None | Would likely qualify for a Categorical Exemption |
| 9 | University Avenue Depressed/ Cantilevered Express Lanes | EPA | -1,313 | -200 (-10%) | -200 (-20%) | \$440 M | \$64 M | \$200 M | \$704 M | Less-than-significant impact | Less-than-significant impact | Some impact to wetlands at edge of Bay | Minimal impact; no acquisition of businesses or residences | Would impact Hetch- Hetchy pipelines; presence of Bay mud will affect trench design/cost; trench will need a system for dewatering of storm water & groundwater; full EIR may be required |

| Location Key | | | | | | | | | |
|--------------|----------------|----|------------|----|---------------|----|-----------|----|--------------|
| EPA | East Palo Alto | MP | Menlo Park | MV | Mountain View | PA | Palo Alto | RC | Redwood City |

-- = No Data Available
na = not applicable

- Grade separations on Bayfront Expressway show benefits for traffic using Bayfront Expressway but some disbenefit relative to commute traffic on residential streets.
- Short-term improvements on Willow and University show minor traffic benefits, low cost, and no environmental impacts.
- Willow Road Express Lanes show travel time benefits and residential commute traffic benefits; the depressed variation shows minimal environment impacts but does indicate some potential sub-grade issues.
- University Avenue Depressed Express Lanes show benefits relative to travel time and commute traffic on residential streets, minimal environmental impacts but some potential sub-grade impacts.

III. Findings and Next Steps

A. Findings

Several improvements were defined and evaluated that would address the Study Goals. One project, Highway 101 Express Lanes, is now under project development based on the analysis conducted in this Study. The two Short-Term Operational Improvements are considered very positive and worthy of early implementation with fairly small investments.

Each of the projects in the “Universe of Alternatives” has been developed to the level of understanding necessary to complete the assessment of traffic benefit, level of cost, potential impacts due to visual, noise, environmental and right-of-way. With this information a prioritization process called next steps was begun.

B. Next Steps

The project sponsors were asked to comment on its direction for the next step for each of the 71 alternatives. The options for directing the project to the next step included the following.

1. An opinion that the alternative should be referred to a specific agency and not considered directly by this group.
2. An opinion that the alternative needed to proceed to Project Development and preliminary design. Project Development means that the project has sufficient support to proceed to a project study report in which alternatives and costs are further defined. Further categorization reflected the importance of certain projects in terms of implementation timing. If short-term development is desired, monies will need to be found to pursue the project. If long-term development is desired, then project funding is not as imminently necessary.
3. An opinion that the alternative should be studied further in Phase 2 of this study. Phase 2 study means that additional information is needed now to be able to make a recommendation to further develop this project concept. It may require some alternatives to be developed or some specific cost information to be furnished prior to recommending it for further development.
4. An opinion that the alternative should to be studied further before making an opinion as to whether to begin project development. There is not enough information about the project at this point to be able to refer it as a specific project for short-term or long-term development. This was not an indication that there was not enough interest to promote this project concept to a Phase 2 study as a group; rather, it indicated a lower priority than improvements placed in Category 3.
5. An opinion that the alternative was not in keeping with the study objectives and should be removed from consideration by this group.

After the sponsors determined that there was sufficient information to share with the TAC, the same exercise was repeated with the TAC. Knowing the TAC's suggested categorization, the same exercise was performed for the PAC without sharing the TAC's opinions. The results were summarized in a second session with the PAC and the TAC reconciled the findings where there had been differences. The final meeting with the PAC has not yet occurred at the time of this writing; but the recommendations from the TAC to the PAC are included below.

C. Categorization

The TAC and PAC have completed categorizing the 71 projects identified in the "Universe of Alternatives." One project has already been forwarded to Project Development. Several other projects are being recommended for Project Development. The "Universe of Alternatives" has been categorized as shown in **Table 4**.

Table 4
Categorization Results

| ID | CATEGORY 1 IMPROVEMENTS | COMMENT |
|----|--|---|
| A | Route 101 Auxiliary Lanes | Referred to VTA; Studied as Alternative 1 |
| D1 | Widen freeway to 10 lanes (County Line to Shoreline) | Referred to VTA |
| I | Extend Bayfront Expressway to Woodside Road | Referred to Redwood City |
| BB | Pedestrian Overcrossing at Ivy Dr. (Willow Road) | Referred to Menlo Park |
| YY | Install transit signal priority to support high-patronage bus routes | Referred to VTA and SamTrans |
| | | |

| ID | CATEGORY 2 IMPROVEMENTS | COMMENT |
|----|--|--------------------------|
| Q | Signal timing during peak travel periods (Willow) | Studied as Alternative 4 |
| R | Prohibit left turns during peak travel periods (Willow) | |
| T | Exit/entrance right turn pockets on Willow (Willow) | |
| HH | Signal timing during peak travel periods (University) | Studied as Alternative 8 |
| II | Prohibit left turns during peak travel periods (University) | |
| KK | Exit/entrance right turn pockets on Willow (University) | |
| XX | Install traffic signal interconnect/communications infrastructure between Middlefield Road and Highway 101 | |
| ZZ | Install trailblazers and/or arterial CMS to provide route guidance | |

| | | |
|-------|---|--|
| | information | |
| AAA | Prepare Incident Management and Traveler Information Plan for Corridor | |
| BBB | Study the possible designation of East Bayshore (San Antonio to University) as reliever route to provide congestion relief and for incident management on Highway 101 | |
| CCC 1 | Improve 101/University Interchange – Construct Phase 2 Improvements | |
| CCC 2 | Improve 101/University Interchange – Improve on-off connections for northbound traffic | |
| DDD | Define residential traffic management elements that complement high-priority capital improvements | |

| ID | CATEGORY 3 IMPROVEMENTS | COMMENT |
|------|---|---|
| B | Reconstruct Embarcadero/Oregon Interchange | |
| C | Reconstruct San Antonio Interchange and eliminate southbound off-ramp at Charleston | Included in study with Alternative 1 |
| G | Improve local access across Highway 101 | Intent is to separate local and regional traffic using existing interchanges and address pedestrian and bicycle linkages across 101 |
| H | Grade separations at Bayfront/Willow and Bayfront/University | Studied as Alternative 3 |
| J | Construct direct flyover connection between Bayfront/Marsh and Highway 101 north of Marsh | |
| DD 1 | Depressed express lanes : 2 lanes each direction (Willow) | |
| DD 2 | Depressed express lanes : 1 lane each direction (Willow) | |
| DD 3 | Depressed express lanes : Reversible 2 lanes (Willow) | |
| DD 4 | Depressed express lanes : 3 lanes with reversible middle lane (Willow) | |
| FF | Tunnel express lanes (maintain existing surface street) (Willow) | |
| GG | Modified depressed express lanes: 1 lane each direction (surface street cantilevered inboard to minimize frontage impacts) (Willow) | Studied as Alternative 7 |
| TT 1 | Depressed express lanes : 2 lanes each direction (University) | |
| TT 2 | Depressed express lanes : 1 lane each direction (University) | |
| TT 3 | Depressed express lanes : Reversible 2 lanes (University) | |
| TT 4 | Depressed express lanes : 3 lanes with reversible middle lane (University) | |
| VV | Tunnel express lanes (maintain existing surface street) (University) | |
| WW | Modified depressed express lanes: 1 lane each direction (surface street | Studied as Alternative 9 |

| | | |
|--|---|--|
| | cantilevered inboard to minimize frontage impacts) (University) | |
| | | |
| | | |

| ID | CATEGORY 4 IMPROVEMENTS | COMMENT |
|----|---|--------------------------|
| F | Build elevated lanes above Highway 101 from Woodside Road to Route 85/Highway 101 North Interchange Conform | Studied as Alternative 2 |
| O | Tunnel beneath East Palo Alto (University Ave. to Highway 101) | |
| | | |

| ID | CATEGORY 5 IMPROVEMENTS | COMMENT |
|------|---|---------|
| D2 | Widen Highway 101 to 10 Lanes plus Auxiliary Lanes (County Line to Shoreline) | |
| E | Widen Highway 101 to 10 Lanes plus Auxiliary Lanes (Whipple to County Line) | |
| L | Elevated roadway along Dumbarton Rail Corridor between University and Highway 101 | |
| M | New Route 84 to Highway 101 Connection through East Palo Alto (surface expressway through East Palo Alto) | |
| N | New Route 84 to Highway 101 Connection skirting East Palo Alto (expressway viaduct along edge of Bay) | |
| S | Prohibit local cross traffic during peak periods (Willow) | |
| U | Set back curb line one land width from current traveled way at driveways(Willow) | |
| V | Eliminate driveway access (Willow) | |
| W | Eliminate selected signalized intersections: Newbridge, Ivy, and Hamilton (Willow) | |
| X | Eliminate signalized intersections and allow right turns only at intersections (Willow) | |
| Y | Eliminate signalized intersections and prohibit any access from local streets (Willow) | |
| Z | Widen Willow Road one lane in each direction | |
| AA | Grade separations at selected intersections: Newbridge, Ivy, and Hamilton (Willow) | |
| CC 1 | Elevated viaduct express lanes: 2 lanes in each direction (Willow) | |
| CC 2 | Elevated viaduct express lanes: 1 lane in each direction (Willow) | |
| CC 3 | Elevated viaduct express lanes: Reversible2 lanes (Willow) | |

| | | |
|------|---|--|
| CC 4 | Elevated viaduct express lanes: 3 lanes with reversible middle lane (Willow) | |
| EE | Grade separations at all intersections (over crossings or undercrossings) (Willow) | |
| JJ | Prohibit local cross traffic during peak periods (University) | |
| LL | Set back curb line one lane width from current traveled way at driveways (University) | |
| MM | Eliminate driveway access (University) | |
| NN | Eliminate selected signalized intersections: Bell, Runnymede, Kavanaugh (University) | |
| OO | Eliminate signalized intersections and allow right turns only at intersections (University) | |
| PP | Eliminate signalized intersections and prohibit any access from local streets (University) | |
| QQ | Widen University Avenue one lane in each direction | |
| RR | Grade separations at selected intersections: Donohoe, Bay (University) | |
| SS 1 | Elevated viaduct express lanes: 2 lanes in each direction (University) | |
| SS 2 | Elevated viaduct express lanes: 1 lane in each direction (University) | |
| SS 3 | Elevated viaduct express lanes: Reversible 2 lanes (University) | |
| SS 4 | Elevated viaduct express lanes: 3 lanes with reversible middle lane (University) | |
| UU | Grade separations at all intersections (over crossings or under crossings) (University) | |
| EEE | Extend Central Expressway to Sand Hill Road | |
| | | |
| | | |

END OF BODY OF REPORT

Note: Appendices will be incorporated in a separate volume at a later date.

2020 Peninsula Gateway Corridor Projects

Work Plan

3/6/08

Purpose

To provide a framework for advancing selected projects identified from Categories 2 and 3 into project implementation and further project development.

- Determine which projects in Categories 2 and 3 should be advanced into project implementation and further project development phases.
- Estimate project budgets
- Identify other funding sources in addition to the funds stated below
- Establish project implementation schedule

Categorization Results

The 71 project alternatives from the “Universe of Projects” were categorized into five categories: 1) Referral to Other Agency, 2) Project Development, 3) Phase II Study, 4) Study Later, and 5) Not Consistent with Goals. The results for Categories 2 and 3 are summarized as follows:

Category 1 - Referral to Other Agency

These projects would be referred to other more appropriate agencies for consideration.

- A: Auxiliary lanes from Embarcadero to Shoreline
- D1: Widen freeway to 10 lanes
- G: Improve local access across 101
- I: Extend Bayfront Expressway to Woodside Road
- BB: Pedestrian overcrossing at Ivy Dr
- YY: Install transit signal priority to support high-patronage bus routes

Category 2 - Project Development

These projects have clearly identifiable benefits, have general support, and have a high probability of being funded.

Willow Road & University Avenue (Traffic Operations Improvements)

- Q, HH: Signal Timing during peak travel periods (adaptive/responsive operation, vehicle detection)
- R, II: Prohibit left turns during peak travel periods
- T, KK: Exit/Entrance Right Turn pockets

Complimentary ITS Elements

- XX: Install traffic signal interconnect/communications infrastructure between Middlefield / US 101
- ZZ: Install trailblazers and/or arterial CMS to provide route guidance information
- AAA: Prepare Incident Management and Traveler Information Plan for Corridor

Other Potential Improvements

- BBB: Designation of East Bayshore (San Antonio to University) as a reliever route for congestion relief/incident management on Route 101 (improve operations at intersections, install signage)
- CCC: Improve 101/University Interchange
- DDD: Define residential traffic management elements that complements high-priority capital improvements

Category 3 - Phase II Study

These project concepts should be developed further.

Highway 101

- B: Reconstruct Embarcadero/Oregon Interchange
- C: Reconstruct San Antonio I/C (eliminate southbound on ramp at Charleston)

Dumbarton Bridge to Hwy 101

- H: Grade Separation at Bayfront/Willow and Bayfront/University
- J: Construct direct flyover connection between Bayfront/Marsh and 101 north of Marsh

Willow Road and University Avenue

- DD, TT: Depressed expressway (2 lanes, 1 lane, 2 lanes reversible, 3 lanes w/ reversible)
- FF, VV: Tunnel Expressway (maintain existing facility at grade)
- GG, WW: Modified depressed Expressway (surface frontage roads cantilevered inboard)

Category 4 – Study Later

These projects are long-term and should be studied further at a later date.

There were no projects under this category.

Category 5 – Not Consistent with Goals

These projects are not consistent with goals established for the 2020 Gateway Study.

Highway 101

- D2, E: Widen freeway to 10 lanes + Aux lanes (Co. line/Shoreline; Whipple/Co. line)
- F: Build elevated lanes above 101 from Woodside Rd to Rte 85/Hwy 101 North I/C Conform

Dumbarton Bridge to Hwy 101

- L: Elevated roadway along Dumbarton RR corridor
- K: Elevated direct connections between Bayfront and 101 along Willow Rd corridor
- M, N: New 101 South connection (through EPA, skirting EPA)
- O: Tunnel beneath EPA
- P: San Francisquito Creek Diversion Structure (dual use tunnel facility)
- P1: Route 101 flood control project potentially down Willow Rd

Willow Road and University Avenue

- S, JJ: Prohibit local cross traffic during peak travel periods
- U, LL: Set back curb line one lane width from traveled way at driveways
- V, MM: Eliminate driveway access
- W, NN: Eliminate selected signalized intersections
- X, OO: Eliminate signalized intersections/allow right turns only on/off
- Y, PP: Eliminate signalized intersections; prohibit any access from local streets
- Z, QQ: Widen roadway on lane each direction
- AA, RR: Grade separations at selected intersections
- CC, SS: Elevated expressways/viaduct structures
- EE, UU: Grade separation at all intersections

Other Improvements

- EEE: Extend Central Expressway to Sandhill Rd

Project Implementation

▪ **Project Development (Category 2)**

Project development of alternatives identified in the Category 2 that have identifiable and near-term benefits for mitigating traffic congestion and improving traffic flow on state routes and local streets. Project development includes preparing project study reports, PA/ED, project reports or other design documents.

- Project Study Reports: Include development of project alternatives; describe environmental issues; determine right-of-way impacts; develop cost estimates; and provide proposed funding and project schedule.
- Project Reports: Describe preferred alternatives; describe project history including the project development process; summarize community interaction; describe existing facility; provide discussion on the need and purpose of the proposed alternatives; identify affected roadway network and related system planning efforts; provide current and forecasted traffic information including accident rates; discuss preferred project alternatives, describe engineering features; develop construction cost estimate including right-of-way costs.
- Other: These projects will be ready for implementation and construction.

Object is to carry the projects to the next step for implementation.

▪ **Additional Engineering Analysis (Category 3)**

Perform additional technical analysis to evaluate issues affecting potential congestion mitigation strategies for project alternatives within the Study area. The work may include performing traffic analysis, right-of-way determination, environmental impacts analysis, underground/groundwater impact analysis, engineer's estimate and may include the following tasks:

- Obtain and summarize traffic count data; identify operational bottlenecks within the project study area
- Review the C/CAG and VTA travel forecasts and provide an independent assessment of the reasonableness and accuracy of the travel forecast results
- Conduct an analysis of the operation of selected alternatives
- Develop preliminary and general assessment of major impacts associated with each alternative including environmental impacts to recreational facilities and traffic and circulation impacts on highways and affected local streets.
- Prepare conceptual cost/engineering estimates for all project alternatives.

Object is to provide data to determine if the project should be selected for implementation.

Proposed Project Funding

- | | |
|---|-----------|
| ▪ San Mateo County Agencies (SMCTA, C/CAG) | \$250,000 |
| ▪ Santa Clara Valley Transportation Authority (VTA) | \$250,000 |
| ▪ Metropolitan Transportation Commission (MTC) | \$250,000 |
| ▪ Other - TBD | |